

## **APPENDIX II**

### **STA-5 Flow-way 3 DRAFT GEOTECHNICAL REPORT**

**April 19, 2005**

**38615334**

South Florida Water Management District  
3301 Gun Club Road  
West Palm Beach, FL 33416-4680

Attn: Ms. Maria Clemente, PE

**Re: WO# 01 Submittal  
Draft Geotechnical Investigation Report  
STA 5 FLOW-WAY 3  
Contract CN040936**

Dear Ms. Clemente,

Please find enclosed the above-referenced draft geotechnical investigation report for STA 5 Section 2. The scope of work has been completed in general accordance with our Work Order #2, Contract CN040936 dated January 12, 2005.

We trust this report is responsive to the District's needs. Should you have any questions regarding the report contents, please feel free to call us.

Respectfully Submitted,  
**URS CORPORATION**

Garfield L Wray, P.E.  
Senior Lead Engineer

Fernando Parra, Ph.D., P.E.  
Senior Engineer

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# **GEOTECHNICAL INVESTIGATION REPORT STORMWATER TREATMENT AREA (STA) NO. 6 EXPANSION HENDRY COUNTY, FLORIDA**

## **1.0 INTRODUCTION**

This report presents the results of the geotechnical investigation for the design of the STA-5 Flow-way 3 expansion. The purpose of the geotechnical investigation is to provide a comprehensive evaluation of the site conditions for the design of the canals and levee systems and related structures for the project. As earthwork represents a major component of the cost of construction, comprehensive assessments of the ground conditions were warranted in an effort to minimize proposed levee and canal sections as a cost savings measure to the project. Evaluation of the design to provide adequate factors of safety, as well as to provide for long term stability and ease of maintenance of the levees and canals, are also important goals of the project team and geotechnical assessment component. Our work was performed in accordance with our approved contract dated October 28, 2004.

## **2.0 SCOPE OF THE GEOTECHNICAL PROGRAM**

The scope of the geotechnical program included performing a series of supplemental field exploratory borings and standard laboratory classification tests. Specifically, the scope of work of the geotechnical program included the following tasks:

- Mobilization of truck-mounted drilling equipment to the site.
- Supervision, drilling, sampling, and coring of 36 supplemental borings for the purpose of defining and classifying ground conditions along proposed levee and canal alignments, and in the vicinity of proposed control structures. Supplemental borings varied in depth from approximately 30 to 75 feet.
- Muck probing at about 100-foot intervals to further delineate the depth of near surface compressible peat deposits.
- Laboratory testing program to determine material classification and properties. Laboratory testing included index classification, compaction and soil corrosion.
- Engineering analyses of at least four levee/canal cross-sections for slope stability, levee settlement estimates, and seepage either into or out of the supply canal and treatment cell areas.
- Preparation of the design report presenting the results of field borings and

laboratory testing, muck probing, and design analysis and evaluations, including development of levee and canal cross-sections for incorporation into project drawings and contract bid documents.

### **3.0 FIELD EXPLORATION AND LABORATORY TESTING**

#### **3.1 SPT BORINGS**

Subsurface conditions within STA-5 Flow-way Section were explored by drilling thirty six (36) Standard Penetration Test (SPT) borings, totaling 1,125 linear feet of drilling. In general terms, the exploration sites were located along the western, southern and eastern boundaries of the cell. The locations of the borings are shown on Plate 1. The plan shows also the locations of soil borings drilled previously by Nodarse & Associates. Thirty five of the URS borings were drilled to advanced 30 feet below grade while the remaining boring located on the north eastern corner was drilled to 75 feet below the existing ground surface. The borings were drilled using a mud (bentonite) rotary technique with a 3-7/8-inch diameter tricone roller bit powered by a Central Mine Equipment model 55 (CME-55) truck-mounted rig.

Sampling of the subsoils was basically by the Standard Penetration Test (SPT) method, which involves driving a 2-inch diameter split-spoon sampler a distance of 18 or 24 inches by repeated blows of a 140-lb hammer freely falling 30 inches (ASTM D1586). The hammer blows are counted and recorded and the SPT-N value computed as the number of blows required to advance the sampler between depths of six to 18 inches below the top of the drive. SPT sampling was generally performed continuously to a depth of 10 feet below grade, and at 5-foot intervals thereafter within the depths of each boring.

The completed boreholes were used to measure groundwater levels after completion of the boring and then filled with a neat cement grout.

Boring logs are presented in Appendix A of this report.

#### **3.2 MUCK PROBES**

The thickness of the surficial organic layer was measured by hand probing at accessible areas along the edges of existing cane fields. At the time of the initial work, the sugarcane fields were fully grown and probings were limited to the edges of the fields. The fields will be harvested by mid April 2005 after which a supplemental program will be implemented. At some probe locations, a 1/2-inch-diameter, pointed steel rod was pushed from natural ground surface to refusal at the top of the underlying rock (caprock) layer. The depth to refusal was recorded as the organic soil thickness. Alternatively, a hand auger or posthole digger was used to provide muck depth measurements. Locations and results of the muck probing are shown in the appendix of this report.

### **3.3 PIEZOMETER INSTALLATION AND FIELD PERMEABILITY TESTING**

The in situ permeabilities of the substrata were measured by field constant head percolation tests. To run the field tests, six piezometers were installed. The locations of the piezometers are shown on Plate 1. The piezometers were constructed in the boreholes using 2-inch diameter Schedule 40 PVC riser pipe. Tests were run with five-foot and ten-foot sections of No. 10 slotted well screen. The annular space between the pipe and the borehole was filled with coarse concrete sand around the screen, and was sealed with grout and soil cuttings above the screen up to the ground surface. The well screen lengths and depths were selected in order to measure both shallow and deep permeability and also to characterize the permeability of individual subsoil layers (peat, caprock, sand, sand/limestone). The permeability results were computed using the equations presented by The US Bureau of Reclamation. The field permeability test results are presented in Table 1 and are included in Appendix B of this report.

### **3.4 LABORATORY TESTING**

Three hundred and thirty three (333) split-spoon (jar) samples were collected in the field and taken to the laboratory. Each sample was visually inspected and classified, per the Unified Soil Classification System, by a geotechnical engineer. Select samples were then tested for physical, mechanical, and chemical properties.

The laboratory physical and mechanical testing included 103 moisture content, 25 Atterberg limits, 77 percent passing No. 200 U.S. Standard Sieve (12), six (6) organic content, and five (5) compaction.

In addition, to the physical testing, we also performed pH, chloride, and sulfate tests on 15 samples, and soil resistivity on 3 samples.

The physical and chemical laboratory test results are summarized in Table 2A and 2B, respectively.

## **4.0 SITE CONDITIONS**

### **4.1 REVIEW OF EXISTING DATA**

Existing reports and technical documents with geotechnical information for STA-6 and its vicinity were provided by the District for URS's review in performing this scope of work. These documents include:

1. Florida Geological Survey, Geological Map of Hendry County, Florida, 1993.

2. USDA, SCS, Soil Survey of Hendry County, Florida, December 1990.
3. U.S. Department of the Interior, Geology of the Western Everglades Area, Southern Florida. Florida Geological Survey, Circular 314, December 1954.
4. Brown and Caldwell, General Design Report, 30% Deliverable, Detailed Design Stormwater Treatment Area 2 and Water Conservation Area 2A Hydropattern Restoration, Contract No.C-E201, January 26, 1996.
5. Central and Southern Florida Project, Comprehensive Everglades Restoration Plan, B.2 Hydraulics, B2.2 Hydrologic Modeling/Methodology Report. Everglades Agricultural Area, Storage Reservoirs - Phase 1. U.S Army Corp of Engineers, Jacksonville District, South Florida Water management District, Assisted by Kimley-Horn and Associates, Inc., January 2004.
6. Burns & McDonnell, Everglades Construction Project. Detailed Design Report. Stormwater Treatment Area No. 5 (STA-5), STA-5 Discharge Canal and STA-5 Outlet Canal, Volume I of II. March 1997.
7. Burns & McDonnell, Everglades Construction Project, Detailed Design Report, Stormwater Treatment Area No. 6 (STA-6), March 1997.
8. LJ Nodarse and Associates, Report of Subsurface Exploration and Geotechnical Engineering Evaluation, Stormwater Treatment Area 5 (STA-5), Everglades Treatment Area, Hendry County, Florida, November 5, 1996.
9. LJ Nodarse and Associates, Report of Additional Subsurface Exploration and Geotechnical Engineering Evaluation, Stormwater Treatment Area Number 5 and 6, Everglades Treatment area, Hendry County, Florida, May 30, 1997.

## 4.2 GEOLOGICAL SETTING AND SUBSOIL PROPERTIES FROM EXISTING DATA

Based on the information collected, we prepared a summary of general geology and subsoil profile and characteristics, as presented in the following paragraphs.

### 4.2.1 Surficial Soils

The soils survey of Hendry County indicates that the majority of the project site is underlain by organic soils. Organic surface soils and peats are formed primarily in shallow freshwater lakes or marshes that are inundated for much of the year. The growth, death and decay of marsh vegetation over thousands of years is responsible for the accumulation of thick deposits of organic muck or peat up to 10 feet in depth south of Lake Okeechobee. The principal vegetation that accounts for formation of peats in the Everglades is sawgrass. Historically, peat accumulation in the Everglades proceeded at a rate of about 3.3 inches every 100 years. By 1914, organic soil accumulations in the Everglades reached their maximum average thickness of 134 in (EIS, 1995).

In 1990, the Soil Conservation Service (SCS) (Beltz et al., 1978) mapped the Everglades agricultural areas (EAA) as part of a soil survey for Hendry County. The Everglades occupy a narrow curved slice of eastern Hendry County. Nine basic surficial soil types are recognized in the STA; Denaud muck, Gator muck, Terra Ceia muck, Pahokee muck,

Lauderhill muck, Dania muck, Plantation muck, Margate sand and Jupiter fine sand. Classification of these soils is largely based on soil properties and their depth to the limestone bedrock, with Terra Ceia representing the deepest soils (typically more than 48 in.) followed by Pahokee muck (between 36 and 96 in.) Lauderhill muck (between 20 and 36 in.) and Dania muck as the shallowest (less than 20 in.). According to the U.S. Department of Agriculture SCS mapping of Hendry County, issued December 1990, the project area is primarily (est. @ 85%) covered by muck soils at the surface. Surficial mucks thin out on the west side of the site and are deepest on the east side.

A summary of the surficial soils to be expected within the project area according to the Soil Survey of Hendry County is presented below:

SECTION	SOIL	NOTES
Northern side of the cell	Plantation, Terra Ceia, Lauderhill and Dania Mucks	Plantation and Dania Mucks: Peat interbedded with black sand, overlying rock. Terra Ceia and Lauderhill Mucks: Peat overlying rock
Western side	Myakka sand predominates. Short sections in Okeelanta muck and Delray sand, depressional	Myakka sand: Uniform fine sand and silty sand. Delray sand: Uniform fine sand overlying sandy clay, underlain by rock. Okeelanta Muck: Peat overlying sand.
Southern edge	Immokalee, Myakka and Margate sands in western 7000ft section, followed by Plantation, Lauderhill, Dania and Pahokee Mucks. Short stretch in Jupiter fine sand at the center of the section	Immokalee sand: Fine uniform sand. Margate sand: Fine uniform, underlain by rock Pahokee Muck: Peat underlain by fractured limestone. Other soils types described above.
Eastern Side	Pahokee Muck	Soil described above.

#### 4.2.2 Limestone Formations

The surface organic soils are generally underlain by the Fort Thompson formation of Pleistocene age, which has an average thickness of 15 feet, and consists of freshwater, marine and brackish-water limestones and marls. The Fort Thompson formation is underlain by the sandy, Tamiami Formation of Pliocene age, which is approximately 150 feet deep in the project area (C&SFP, January 2001). At the base of the Tamiami lie the relatively impervious beds of the Hawthorn formation. The Hawthorn formation of

Miocene age is 400 to 600 feet. thick in Hendry County and confines older artesian aquifers formed by the Tampa/St. Marks Limestone of Miocene age, the Suwannee Limestone of Oligocene age, and the Ocala Group and Avon Park Limestone of Eocene age. The Suwannee Limestone, Ocala Group and Avon Park Limestone form the Floridian Aquifer at depths of 600 to 1,800 feet below the surface.

#### **4.2.3 Surface Conditions**

The Everglades area is topographically flat with elevations generally less than 20 feet (NGVD). The ground surface generally slopes from north to south with an average gradient of 0.15 foot per mile (Parker et al., 1955). The highest ground elevations occur in the northern Everglades at 17 feet (NGVD). The lowest elevations occur in the southern Everglades at 0.3 to 1.0 foot (NGVD).

STA-5 Flow-way 3 section is located just west of the Palm Beach-Hendry county line. It is bordered by the L-3 Canal on the west and Rotenberger Wildlife Management Area immediately to the east, STA-5, Flow-way 2 to the north and the U.S. Sugar Corporation Unit 2 sugar cane farm to the south. Terrain elevations range from approximately 10 to 13 feet, NGVD. Higher elevations, on the order of 14 to 15 feet, NGVD occur near the western side of the cell. The area is dedicated to sugar cane production.

#### **4.2.4 Subsurface Conditions**

Based on the information in the borings, we have generalized the subsurface stratigraphy at the site as described in the paragraphs below.

***Layer I: Fill*** – This layer consists of stiff, crushed limestone with silt, clay, shell and organic material. The material is classified as poorly graded sand with silt, silty sand, and clayey sand. The fill varies in thickness from approximately two to four feet. Thicker fills occur at the elevated existing levees. SPT N-values recorded in this layer range predominantly from six to 34 blows per foot (bpf) with an average value of about 18 bpf, indicating a layer that is loose to medium dense.

***Layer II: Organic Silty and Clayey Peat*** – This layer consists of dark brown fibrous or organic silty and clayey fibrous peat. The peat layer is one to seven feet thick, averaging approximately 4 feet thick in the STA 5 borings. Moisture contents in the peats range from approximately 35 to 459 percent. Organic contents in this layer range between about eight and 79 percent. SPT N-values for the peat range predominantly from one bpf to 5 bpf, indicating a mostly soft to very soft stratum.

***Layer III: Limestone and Calcareous Silt and Clay with Limestone Fragments*** - Underlying the organic soils, is silty and clayey limestone and sandstone, and calcareous silt and clay with limestone fragments, and shell and organics interbedded with silty and/or clayey sand. Fines content in the silty/clayey sands

is on the order of 10 to 30 percent. The natural moisture contents in the fine-grained soils range from 10 to 35 percent. The Atterberg Limits tests indicate liquid limits of predominantly 19 to 29 percent, with plasticity indices of three to ten percent. SPT N-values recorded in this layer range from two bpf to about 85 bpf with occasional refusal conditions. The average SPT N-value in this layer is about 12 bpf.

In general terms, shallow-lying limestone is not apparent in the south western and the western sides of cell 3 of STA-5. In these areas, other deeper limestone strata, covered by thick strata of clayey sand or clays, occur at depths that exceed 12 feet or so. Shallow limestone seems to prevail in the rest of the edges of STA-5, with the exception of local areas (case of borings CB0016, 20, and 33). At these particular sites, the profile within the explored depth of 30 ft consists predominantly of loose to medium dense clayey sands interbedded with soft clays.

Groundwater was reported at depths that range from approximately two to six feet, averaging 4 feet. Corresponding NGVD elevations range from approximately +6.5 to +13.5 feet, averaging about Elevation +10 feet NGVD.

Groundwater levels at the site fluctuate as the result of localized dewatering of site canals for agricultural activities at the site. The range of water tables reported during field investigation likely represents the lower range during the dry season and harvesting activities to the higher elevations typical of the wet season.

#### **4.2.5 Design Physical Soil Parameters**

Based on results obtained from the physical laboratory tests performed on representative borrow materials and soil samples and data from existing reports, we estimated design physical soil parameters for levee fill and subsurface layers at STA 5. These parameters are summarized in Table 3. For purposes of comparison, the parameters used for previous analyses at STA 2, STA 5, and STA 6 are presented in Table 4.

#### **4.2.6 Results of Chemical Testing**

Chemical tests comprising pH, sulfates and chlorides were performed on 15 samples. The results are presented in Table 2. The pH varies from a low (acidic) value of 4.7 to a high (basic) value of 8.4. Chloride and sulfate contents ranged from 90 to 120 and 60 to 108 parts per million, respectively.

Several factors are used as indicators of the corrosion potential of soil. These factors include soil pH balance, and concentration of sulfate and chloride ions. Generally, a pH less than seven (7) indicates an acidic soil environment that could be potentially corrosive to buried metal and concrete. Sulfate and chloride ion concentrations greater than about 1,000 and 300 parts per million (ppm) respectively indicate soil that is potentially corrosive to buried metal and concrete. Soil resistivity less than about 10,000 ohm-cm indicate soils that are potentially corrosive to buried metals. The results of chemical

testing indicate that the materials tested have a low potential for corrosion to buried metal and concrete based on pH, sulfate and chloride ion concentrations, and soil resistivity. Available corrosion protection measures include dielectric coating of metal pipes, cathodic protection for welded steel piping, and the use of ASTM Type II or Type IV cement for concrete. A corrosion engineer should be contacted for specific recommendations if needed.

## **5.0 DESIGN EVALUATIONS**

### **5.1 GENERAL GEOTECHNICAL SITE SUITABILITY**

The site is considered generally suitable for the proposed STA 5 Flow-way 3 expansion. The near surface soil conditions with the highly compressible organic soil (peat) at ground surface, present challenges to the anticipated earthwork construction and requires special considerations in both design and construction. The levees will be stable, but they will settle appreciably. Most of the settlement will occur relatively quickly, and will be compensated for by overbuilding of the levee height during construction. In addition to settlement issues for the constructed levees, the near surface weak peat soils and the high groundwater table could result in unstable driving conditions for heavy construction equipment.

### **5.2 LEVEE CONSTRUCTION MATERIALS ZONING PLAN**

Levee designs must effectively utilize available onsite materials while maintaining adequate factors of safety against instability under proposed operating conditions over the life of the project. Effective utilization of existing onsite borrow fills from canal excavations is required to balance excavation quantities and to minimize earthwork construction costs.

The geotechnical design team has considered the details of the proposed construction and the results of the field investigations performed for this and previous studies. Construction of the proposed levee systems for STA 5 Flow-way 3 can be accomplished over the existing compressible peats provided the designs compensate for the anticipated peat settlement, and the long-term structural integrity of the levee foundation system is maintained. Levee construction over the existing peats is practical, as it will reduce construction costs by eliminating the need to excavate and replace these peat materials.

The levee design for this project proposes to use fill from the canal and borrow excavations resulting in a composite mixture of compacted peat, sand, and limestone. Obviously, the mixing of the insitu excavated materials must be controlled to maintain integrity of the levee fill material. It is recommended that the organic soils be mixed with the underlying interbedded limestone and sandy soils where the average peat thickness is less than three feet. Constructability reviews with earthwork contractors experienced with similar construction in the area, indicate that borrow/canal areas can be effectively and economically drilled and blasted where peat thicknesses are less than three feet

without removing the peats. Peat thicknesses greater than approximately three feet create access problems to drilling, blasting and materials excavation equipment, and the construction costs of working over such thicknesses increase significantly. On other STA sites, the peats in canal areas have been excavated to allow access for blasting.

Review of the field data indicates that significant portions of the site contain surface organic soil deposits with thicknesses of two feet or more. Correspondingly, to facilitate excavation activities and to comply with proposed borrow material mixing requirements, it will be necessary to strip off sections of peat and temporarily stockpile such material in non-levee areas. The stockpiled peats should be allowed to drain and subsequently wasted on the levee slopes as non-structural fill or used as levee cover to support vegetation growth or wasted in canal plug areas. Wasting of excess peat should be confined primarily to outboard slopes of a structural levee core along supply and discharge canals and along interior slopes of the treatment cells. Peats should not be wasted on interior levee slopes where canal flow conditions may transport buoyant peat masses to inflow/discharge control structures.

Levees will be constructed by placing fill in thick controlled lifts over a prepared peat surface. A layer of geogrid reinforcement will be required at or near the surface of thick peat layers to improve levee stability and integrity during consolidation of the underlying peats. Levees will be overbuilt to accommodate long-term consolidation of the underlying peats. The anticipated peat settlement is discussed below in Section 5.4.2

Based on previous computations and experience, we estimate shrinkages of 40 percent for the organic soils that are to be blended with limestone/sand mixes, and 66 percent for segregated (stockpiled) organic soils. The hard limestone will bulk during excavation and therefore a shrinkage factor of 5 percent is assigned to the granular materials (i.e composite limestone, silty/clayey sand).

### **5.3 SUMMARY OF ADOPTED DESIGN PARAMETERS**

The key design parameters used in the seepage, slope stability, and settlement analyses are listed in Table 3. Selection of the parameters was based on our assessment of previous investigation in similar geological conditions, the recommendations of the reports by Burns & McDonnell for STA-5 and STA-6, and the results of our field exploration and laboratory testing performed for this investigation.

## **5.4 ENGINEERING ANALYSES, CONCLUSIONS, AND RECOMMENDATIONS**

### **5.4.1 Seepage Analysis**

Seepage quantities were estimated using the two-dimensional computer program SEEP2D developed by the US Army Waterways Experiment Station. This program uses

the finite element method to compute flows and heads for confined and un-confined plane and axisymmetric steady state seepage problems, given specific boundary conditions and material permeabilities.

A total of five representative cross-sections were evaluated for boring locations CB-12, CB-28, and CB-33, as well as TB-3 and TB-21 from previous exploration by Nodarse and Associates. Each cross-sections consist of a seepage collection canal and accompanying levee. The estimated canal depth was 12 feet, with a bottom elevation of - 2 feet NGVD, and a base width of approximately 8 feet. The assumed side slope for the canals is 3:1 (horizontal to vertical) within a depth of four feet below grade, and no steeper than 2:1 below that depth. Levee sections 8.5 and 10.5 feet high were analyzed. The crests of levees were conservatively set at elevation +20.5 and a levee crest width of 14 feet was used. Upstream and downstream levee side slopes of 3:1 were considered.

The headwater level was taken at Elevation +17 feet NGVD. The level was taken as the static water level (SWL) elevation, which approximately corresponds to Elevation +8, as per the levels detected at the boreholes selected for the analyses.

Flow through the upper organic soil takes place across the natural, uncompressed muck as well as through the muck that undergoes consolidation due to the embankment loading. The modeling incorporated the marked difference in permeability between the muck conditions cited.

The seepage analyses results are presented in Table 5. The computed seepage quantities range from about 1.5 to 11 cubic feet per day per foot of levee (cf/d-ft levee), with the lower values corresponding to subsurface profiles at CB-12 and CB-33 where muck was absent. This order of magnitude of seepage appears to be consistent with previous District experience for the ENR and STA 2. The diagrams indicate very little seepage occurring through the levee fill, with the majority of the flow being base seepage in the relatively permeable sands and limestones beneath the peat layer.

Flow nets and corresponding discharges are displayed in Appendix C of this report.

#### **5.4.2 Settlement Evaluation**

Settlement estimates are essential in determining the required overbuild of levees to compensate for short-term and long-term levee settlements associated with the presence of relatively thick layers of organic soils. An equation was developed which accounts for the levee height, peat thickness, and compressibility of peat and fill materials. The general settlement equation is shown below.

$$S = 0.03 (H+S) + 0.61 (T) \log \{ [T+3.2 (H+S)]/T \}.$$

The equation uses three percent of total height of levee and anticipated settlement to account for the internal compression of fill. The factor 0.61 is equivalent to a compression index of 6.7 assuming an initial void ratio of 10 for peat materials.

Settlement evaluations were conducted primarily using (1) existing laboratory consolidation test data, and (2) back-calculation of peat compression from soil borings, muck probes, and visual measurement of existing levee heights. Total settlements of levees include (1) secondary consolidation, (2) compression of fill, and (3) additional settlements resulting from overbuild.

For the secondary consolidation, the ratio of  $C_a/C_c$  (secondary to primary compression index) was assumed as 0.035 to 0.085 for fibrous peat (Holtz and Kovacs, 1981). The resulting secondary consolidation for peat thickness varying from 1.5 to six feet was calculated as approximately 12 percent of the initial peat thickness over a 40-year period. The compression of fill can be estimated as 3 percent of the total height of the levee and anticipated settlement in GDM's general settlement equation. It is proposed here to use 5 percent of the levee height to account for settlement due to its own weight and future traffic compaction. Due to the granular nature of the fill, the compression of this material should be a sole function of levee height and compaction effort, and will likely not be affected by the peat thickness. The final component of total settlements results from the additional fill overbuild on top of the design levee height. The required overbuild takes into account the sum of design levee height and anticipated settlements which comprise the levee fill to calculate total long-term secondary compression settlements.

A series of design charts were developed for estimating total settlements of the levees as part of the STA-2 study. Using the design charts cited, total settlement of levees for the expected thickness of organic soils were computed as presented below.

<b>ORGANIC SOIL THICKNESS (ft)</b>	<b>PRIMARY SETTLEMENT (ft)</b>	<b>SECONDARY SETTLEMENT (ft)</b>	<b>TOTAL SETTLEMENT (ft)</b>
1.5	0.4	0.2	0.6
3.5	0.9	0.4	1.3
5	1.3	0.6	1.9
6	1.6	0.7	2.3

An alternate approach was pursued for STA-2 design study to back-calculate and crosscheck the approximate amount of compression of peat below existing road levees, and develop a correlation to estimate the settlement of peat for the design cross-sections. Soil borings were conducted from the top of roads and the approximate heights of road levees above the adjacent peats were visually determined. Assuming the peat layer which exists at the ground surface immediately adjacent to the road was initially uniform across the cross-section of road levees, the amount of compression of the peat layer was determined as the difference between the depth to the top peat encountered in the borings, minus the height of the road levee above the adjacent peat surface. Settlements estimated by the correlation were found to be less than those calculated by using laboratory consolidation test data. However, the data are useful for comparative purposes and indicate that the settlement estimates using this approach are slightly conservative.

Calculations performed for levees in the vicinity of STA 1W indicate that 50 percent of the settlement is anticipated within one day and 90 percent of the settlement within four days for peat layers five feet or less in thickness. For STA-2, the time-dependent consolidation of peat was evaluated by using the coefficient of consolidation of 1.0 square foot per day. For the peat thickness of 2, 4, 6, and 8 ft, the primary consolidation would be completed within 1, 4, 9, and 16 days, respectively.

The above times to substantially complete primary consolidation are relatively short, on the order of a few days. Therefore, any departures from the estimates may be noticed relatively quickly. Corresponding remedies, if needed, can be implemented while construction equipment is still on-site.

Burns & McDonnell studies dated 1997 for STA 6 recommended that the organic soils exceeding a thickness of 3 feet be removed and a key installed under the central (highest) portion of the levee. The scheme would minimize the settlement of the central part of the embankment. However, other considerations related to the differential settlement and potential levee distress and longitudinal cracking of the compacted section during levee construction soils need be addressed with this option.

### **5.4.3 Stability Analyses**

We performed slope stability analyses for the levee section described above. The analyses were performed using the computer program PCSTABL, developed at Purdue University for the Federal Highway Administration. The program solves general slope stability problems using a two-dimensional limit equilibrium method. The computation for the factor of safety against slope instability is performed using the method of slices. The program uses unique random techniques for generation of failure surfaces within horizontal and vertical limits prescribed by the user. PCSTABL is capable of handling heterogeneous soil systems, anisotropic soil strength properties, excess porewater pressures due to shear, static groundwater and surface water, pseudo-static earthquake loading, surcharge boundary loading, and tie-back loads.

We performed analyses for the end of construction, and steady state seepage for the downstream slope, and rapid drawdown for the upstream slope. A conservative maximum water level at elevation +17 feet, NGVD was used for the steady state rapid drawdown conditions. The stratigraphy of each design cross-section consisted of unreinforced levee fill over peat, underlain by limestone or other clayey/silty soil. The heights of levees were selected based on a +20.5 feet NGVD levee crest elevation. In the analyses, it was assumed, that the fill will be a compacted mixture of peat and in-place limestone/silty, clayey sand soil. The soil parameters used in the analyses are based on previous studies, our and our field exploration and laboratory testing as described before. Analyses were performed for subsurface conditions at URS Borings CB-12, CB-16, CB-33, and Nodarse Borings TB-3 and TB-21. The parameters used at each of the boring locations are summarized in Table 3. For each case analyzed, 200 randomly generated failure surfaces were analyzed.

In evaluating the levee stability, two failure surface types, circular and wedge, were evaluated. The circular surface failure is considered the traditional failure mode. The wedge type analysis was performed as the design anticipates leaving the mucks in place beneath the constructed levee section and the wedge type analysis evaluates the base shear stability of the levee cross section for movement along a horizontal plane through the mucks at the base of the compacted levee.

Initially, boundary conditions including crest width, embankment side slopes, bench width, seepage canal bottom elevation, and water elevations in the STA and seepage canal were set at maximum SPF water levels in order to evaluate the impact of each condition on the global stability of the dam. In addition, boundary conditions required to provide adequate factors of safety for seepage were also taken into consideration for the global stability analysis.

The results of the stability analyses are summarized in Table 6. Review of Engineering Manual EM 1110-2-1902 (October 31, 1993) – Slope Stability, Published by the U.S. Army Corps of Engineer (USACE) indicates that the required minimum factors of safety for long term (steady state seepage at maximum storage pool elevation), end-of-construction and rapid drawdown are 1.5, 1.3 and 1.3, respectively. The Table indicates that the computed minimum safety factors exceed or comply with the USACOE-required minimum values. We consider strength gain will be experienced by the consolidating soils over time, and the steady state condition factors of safety will increase based on the soil strength gain.

The results indicate that the most critical failure surfaces in the levees extend only to a limited distance from the toe and do not exhibit a deep base failure in the limestone to jeopardize the stability of canals. This is consistent with previous study results.

We performed analyses for the steady state seepage condition with canal water level at Elevation +8 feet NGVD. The soil parameters used in the analyses are based previous studies, our and our field exploration and laboratory testing as described before. Analyses were performed for subsurface conditions at CB-12, CB-16 and CB-33, and Nodarse's TB-3 and TB-21. For each case analyzed, 200 failure surfaces were evaluated using the Janbu and the Rankine wedge methods. The results of the stability analyses are presented also in Table 6. The results indicate minimum factors of safety (FS) ranging between 1.2 and 1.9. Given the facts that conservative soil strength parameters were used in the analyses and that the critical failure surfaces with the lowest FS value correspond to shallow slips, we conclude that the proposed canal section is safe against slope instability.

For the canal analyses, shallow slope failure surfaces developed in the peat or the underlying materials only, and do not extend to affect the toe of the levee. Therefore, it is concluded that separate stability analysis of cut slope in the canals and fill in the levees is appropriate. The toe of the upstream levee face should be located at a distance exceeding 20 feet from the edge of the canal.

#### **5.4.4 Canal Erosion Potential**

This section outlines canal erodability criteria suitable for the preliminary design of the canals of STA 5 Flow-way 3 project. The section identifies material specific limiting hydraulic conditions which if exceeded will require the application of appropriately designed erosion control measures.

The canal system of STA 5 Flow-way 3 consists of supply distribution and seepage collection canals which will be excavated in the existing peat and rock of the site. The nominal soil profile consists of one to eight feet of peat, an intermittent thin layer of weathered limestone, and a layer of competent limestone that extends below the bottom elevation of the canals. Levees flanking the canal excavations will be constructed of excavated limestone or a mixture of peats and limestone. It is assumed that flow velocities in unprotected canals will not exceed 2.5 fps for the proposed flows and levels without erosion protection measures. The canals will be designed to limit the flow velocity to within this limit. Flow velocities are expected to be high around the control structures. Consequently, erosion control measures will be required in these areas.

##### **Incipient Motion Analysis**

An evaluation of the relative canal erosion stability can be made by evaluating incipient motion parameters (FHWA, 1991). The definition of incipient motion is based upon the critical or threshold conditions where hydrodynamic forces acting on one grain of sediment have reached a value that will move the sediment grain. Under critical conditions, or at the point of incipient motion, the hydrodynamic forces acting on the grain are balanced by the resisting forces of the particle.

Incipient motion may be estimated on the basis of maximum allowable velocities or maximum allowable tractive force or shear stress for various types of canal materials (Chow, 1959). The limit of 2.5 fps provides for these shear limits.

For final design, it is appropriate to evaluate scour at various points on the canal cross-sections for soil types and discharge conditions. The appropriate method of evaluation should be based on the incipient analyses as outlined herein.

The previous discussion relates to straight channel sections. Scour at areas of bends, flow diversions, structures, bridges, and pump discharges all amplify the scour potential and therefore require structure specific analysis. Appropriate procedures for the evaluation of scour protection requirements at such flow direction change and/or contraction points are provided in the scour evaluation documentation developed by the Federal Highway Administration (FHA).

**Peat Soils** - Peat is a fibrous, partially decomposed organic matter or a soil containing large amounts of fibrous organic matter. Peats are dark brown to black, loose, and extremely compressible. When dried, peat will float. A literature research did not reveal any velocity or shear stress limits for peat soils. It will be necessary to rely on the experience gained from the construction and operation of the various STA projects for

final design velocity limits. As a preliminary guide, flow velocities up to and on the order of 2.5 fps are sufficiently low to allow the growth of vegetation (Chow, 1959). Without further guidance, it would be prudent to limit unprotected peat canal sides to sections where the maximum velocities are less than approximately 2 fps.

**Limestone** - The canal design penetrates into a layer of limestone. Normally limestone is generally considered scour resistant. The USACE suggests a general velocity limit for sedimentary rock of 8 to 10 fps in their design manual referenced previously. This is higher than the nominal 7 fps maximum velocity for which the canal system will be designed. It is recommended that further evaluation based upon the FHA's interim procedure be performed. After encountering several bridge foundation problems in rock, the FHA developed an interim guidance memorandum (FHA memo, 1991) on the scour ability of rock. The guidance utilizes RQD to reflect the relative frequency of discontinuities, the compressibility of the rock mass, and may indirectly be utilized as a measure of scourability. Soft limestones which have an RQD of less than 50 should be assumed to be soil-like with regard to scour potential.

If scour in the limestone at high velocity pump or discharge points is a concern, there are two possible approaches. One approach is to provide riprap or concrete protection to prevent the limestone from scouring. The second involves estimating the equilibrium configuration of the scour hole and simply excavating the limestone to a depth and shape approximating it. Guidance for estimating the discharge scour hole shape and size are available in a range of USACE and FHA publications.

## **5.5 Structure Foundations**

The project requires the installation of a number of structures for the inflow and discharge of storm water to the treatment cells. The hydraulic structures for the project include gated culvert inflow and outflow structures, a diversion structure, and a pump station. The structures can be supported by shallow footings or mat foundations placed on in-situ soils/limestone. Structure foundations should not be placed on top of the highly compressible peat soils.

We recommend that the proposed structures be supported on shallow foundations designed for a maximum allowable contact stress of 3,000 pounds per square foot (psf) for dead plus live loads provided the site has been prepared as described above. This value may be increased by 25 percent when considering total loads including temporary wind loads. The bottoms of footings should be embedded at least 18 inches below lowest adjacent grade. To assure an adequate factor-of-safety against a general shearing failure, strip and monolithic slab footings should be at least 18 inches wide, and isolated footings should be no less than 30 inches wide.

Lateral forces may be resisted by passive earth pressure acting on the vertical foundation faces and by friction acting between the bottoms of foundations and the supporting subgrade. We recommend using an equivalent fluid weight of 160 pounds per cubic foot (pcf) to compute passive resistance for moist soil above the water table, and 80 pcf to

compute passive resistance in submerged soil. Passive resistance in the upper 12 inches of soil should be neglected unless it is confined by a slab or pavement. Frictional resistance may be computed using a factor of 0.30 times the sustained dead loads. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) surrounded by in-situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative compaction, and 2) able to withstand horizontal movement on the order of 1/4 to 3/8 inch.

Foundations designed in accordance with the recommendations above are expected to experience maximum total settlements of two inches or less. Differential settlements that occur between adjacent unequally loaded foundations are not expected to exceed one inch. Due to the granular nature of the subsoils, foundation settlements should occur rapidly and be virtually completed by the end of structural construction. These settlement estimates are based on removing the peat soils from beneath shallow footings.

## 5.6 Below-Grade Walls

Below-grade walls for the hydraulic structures/pump station should be designed to resist lateral earth pressures from soil and water against the back of the walls. For stability analyses of these walls, the soil bulk unit weight may be taken as 120 pounds per cubic foot (pcf). Wall pressures under static loading conditions should be computed using a triangular pressure distribution and based on equivalent fluid weights of 35 and 55 pcf respectively corresponding to the active and at-rest earth pressure conditions. The active case is for walls that are unrestrained at the top, while the at-rest condition is for restrained walls. Where traffic loading will occur within 10 feet of the back of the wall, the wall should be designed to resist an additional traffic surcharge load of 100 psf acting as a rectangular distribution over the wall height. Other surface surcharge pressures acting parallel to, and within a distance  $H$  of, the back of below grade walls (where  $H$  is the wall height), should be accounted for by applying a uniform lateral pressure using a coefficient of 0.4 the surcharge intensity over the upper 10 feet of the wall.

## 5.7 Seismic Stability and Liquefaction Potential

URS evaluated the proposed levees for stability under seismic loading, and concluded that the proposed levees will be stable against rotational instability and excessive deformation under anticipated ground shaking. We reviewed the March 29, 2005 draft *Design Criteria Memorandum # DCM-6* titled Liquefaction Evaluation of CERP Dam Foundations prepared by the EvergladesNow/Acceler8. We concur with the reference of this memo to Seed's (1978) conclusion that a well built embankment can withstand a PGA of 0.2g without significant deformation/compromise of stability. Given USGS's (2002) mapping of 0.02 to 0.036g for the area, we consider that under a maximum credible peak ground acceleration of 0.036g, the levees will be stable.

The DCM-6 draft memo analyses used clean sand and PGA of 0.036 and computed no liquefaction regardless of blow count using Youd and Seed (2001). Given the relatively

higher silty and clayey fines content of the STA 5 foundation soils, we conclude that liquefaction potential is negligible for STA 5.

## **6.0 CONSTRUCTION RECOMMENDATIONS**

This section provides general recommendations for the construction of the levees and canal including recommendations for general site preparation, excavation, and dewatering.

### **6.1 SITE ACCESS AND WORK SURFACE PREPARATION**

Access to the site, preparation of work surfaces to receive fill, fill placement, and equipment mobility in proposed canal and borrow excavation areas will present major considerations to the earthworks contractor. Access to and within the site will be restricted due to the remote nature of the site and the difficult surface conditions prevalent in the project area. The presence of the surface peats will pose serious problems to the movement of heavy draglines, bulldozers, compactors, and other construction equipment around the project site. Additionally, the generally high groundwater levels will further complicate site access particularly during the wet season and after significant rainfall events.

Site preparation activities will include preparation of levee and canal alignment areas and the potential construction of limited necessary temporary access roadways to and from work areas. Levee and canal alignment preparation shall include the clearing and grubbing of existing brush and low vegetation. Stands of dense vegetation will require clearing by cutting at the ground surface. The limbs should be removed and disposed of by burning. It is desirable to attempt to leave brush and low vegetation and the root mat from such vegetation in place beneath levees as these materials will act to stabilize the surface peats. In existing sugarcane farm areas, very little site preparation is anticipated. Limited clearing at existing property lines and intermittent infilling of dewatering canals will be required in these areas.

In interior cell areas it will be necessary to locally fill some existing dewatering ditches to mitigate short-circuiting of flow conduits through the cells. Infilling requirements for these ditches will be dictated by cell flow dynamics and are beyond the scope of this study. However, it is anticipated that such canals can be infilled with either adjacent spoil from the canal excavation or loose fill trucked in place and then covered with a thin layer of peat to facilitate wetland type vegetation growth.

### **6.2 LEVEE AND CANAL CONSTRUCTION**

#### **6.2.1 Fill Materials**

The levee fill material is to consist of onsite soils obtained from the canal excavations. The material will be a combination of broken limestone, sand and peat blended vertically

(in-place) during the excavating sequence. To further assure that the mixture is well graded, the maximum particle size should be 12 in, although up to 10 percent of oversized material (between 12 and 24 inches in diameter) could be allowed. Care should be exercised in placing the oversized materials to assure that nesting does not occur and to further assure that the oversize particles are fully surrounded by finer grained materials. Nesting of the oversize materials is not desirable since it can lead to voids incorporated in the fill and to piping failure of the levee.

In canal areas, the organic soils in the cut will need to be excavated separately from the granular materials and stockpiled. The organic excavation may be partial to thin the peat to the prescribed one foot maximum thickness, followed by the vertical blending described above. The gradation requirements for the granular materials are as described above. After the granular materials are placed to form the design section of the levee, the excess organics may be used to dress out the slopes, but at angles no steeper than 4 to 1 (horizontal to vertical).

Shrinkage factors of 50 percent and 66 percent should be used for the blended peat and the segregated/stockpiled peat, respectively. The limestone will bulk when excavated but will be combined with sandy soils which will shrink from in going from the cut to levee. Therefore, a nominal shrinkage factor of 5 percent should be used for the granular material (sand-limestone mix).

## **6.2.2 Levee Placement Requirements**

As a general rule levee embankments are constructed as homogeneous sections because material zoning for such remote and low head levees is usually neither necessary nor practicable. However, where materials of varying permeabilities are encountered in borrow areas, the more impervious materials should be placed toward the waterside of the embankment and the more pervious material toward the landside slope. Where required to improve under seepage conditions, landside berms should be constructed of the most pervious material available and waterside berms of the more impervious materials. Where impervious materials are scarce, and the major portion of the embankment must be built of pervious material, a central impervious core can be specified or, as is more often done, the riverside slope of the embankment can be covered with a thick layer of impervious material. The latter is generally more economical than a central impervious core and is adequate in most cases.

The levee fill should be placed and compacted, as necessary, to achieve a minimum dry density equal to 90 percent of the Modified Proctor value, per ASTM D1557. Single lift construction will not be permitted. Multiple lift construction is acceptable provided the thickness of the initial lift is limited to one-half the levee height above existing grade. Typical initial lift thicknesses should, therefore, be in the range of 2 to 3 feet maximum thickness. The surface of each lift should be made level to allow for density testing prior to placement of the next vertical lift. As a general rule, compaction control testing should be done for every 2,000 cubic yards of fill placed. The inspectors used must be well-trained to observe construction operations, minimizing the number of field density tests

in favor of devoting more time to visual observations, simple measurements, and expedient techniques of classifying soils, evaluating the suitability of their water content, observing behavior of construction equipment on the fill, and indirectly assessing compacted field densities.

Inadequately designed or constructed culverts or other penetrations beneath or within levees can cause serious damage to levees. Each penetration should be evaluated for its potential damage that would negatively impact the integrity of the levee system and could ultimately lead to catastrophic failure. During high water, seepage tends to concentrate along the outer surface resulting in piping of fill or foundation material. High water also results in uplift pressures that may cause buoyancy of some structures. Seepage may also occur because of leakage from the pipe. In addition, loss of fill or foundation material into the culvert can occur if joints are open. The methods of culvert installation should be understood by the designer to anticipate problems that may occur. Some of the principal inadequacies that are to be avoided or corrected are as follows:

- Culverts having inadequate strength to withstand loads of overlying fill or stresses applied by traffic.
- Joints unable to accommodate movements resulting from foundation or fill settlement.
- Unsuitable backfill materials or inadequately compacted backfill.

Major factors to be considered regarding these issues are as follows:

- The height of the levee.
- The duration and frequency of high water stages against the levee.
- The susceptibility to piping and settlement of levee and foundation soils.
- The structural adequacy of existing culvert and joints, and the adequacy of the backfill compaction.
- The ease and frequency of required maintenance.
- Possible consequences of piping or failure of the culvert.
- Previous experience with the owner and the constructors in constructing and maintaining culverts.

### **6.2.3 Test Section Requirement**

Prior to construction, it is recommended that a test levee section be constructed which demonstrates the constructability of the proposed levee design and contractor's proposed construction methodology. The intent of the test section will be to verify the proposed construction procedure. The test section should be instrumented with settlement plates and extensive survey controls provided to evaluate measured settlements and bulking/shrinkage of the borrow materials. The test section should be constructed over a 500 foot length and will be used to establish approval of the procedure for subsequent construction.

### 6.3 EXCAVATIONS AND DEWATERING

Excavations will be required for seepage collection canals, borrow areas, and for project structures. Excavations into the in-situ limestone will require blasting to fracture the cemented limestone structure to allow for excavation by draglines or backhoe equipment. Excavations through the surface peats and uncemented sands will require that cut slopes be excavated to 1:1 or flatter slopes to prevent sloughing of the materials into the excavation.

Due to the high groundwater level, dewatering may be required for excavations more than a couple of feet below the ground surface. Excavations for borrow canals may be completed in the wet without dewatering or the contractor may attempt to dewater with large surface stationed pumps. Due to the high transmissivity and jointed nature of the insitu limestone, groundwater flows to the excavation will be significant and would likely preclude effective dewatering of significant sections of canal and borrow excavations greater than one-half mile. Fill material excavated in a wet condition, will need to be stockpiled and drained prior to re-use. The fines content of stockpiled soils could be appreciable, thus reducing the permeability and therefore the ability of the soils to drain quickly.

Excavations for structures will extend to depths 10 or more feet below the ground surface. To facilitate their construction, it may be necessary that excavations be potentially sheet piled and dewatered with well points. Groundwater levels in these excavations should be maintained at least one (1) foot below the bottom of the excavations. Groundwater should not be allowed to flow into such excavations should such flow carry soils from beneath foundation areas or result in quick or unstable bottom conditions.

### 7.0 LIMITATIONS

The contents of this report have been tailored to the requirements of the proposed STA 5 Flow-way 3expansion project in Hendry County, Florida. The recommendations that have been discussed herein are based on URS's interpretation of site conditions and project needs at the time of writing, our field exploration, and on our engineering analyses and previous experience with similar projects in the area.

The scope of this investigation was limited to evaluating geotechnical design parameters for the project. Environmental conditions such as the presence of petroleum products, hazardous waste, radioactivity, irritants, pollutants, radon or other hazardous substances and conditions were not the subject of this study. The presence (or absence) of such contaminants or conditions is neither implied nor suggested by this memorandum. Additionally, evaluation of karst-related sinkhole potential was not included in the scope of this study.

URS warrants that its services are performed, within the limits prescribed by its Clients, with the usual thoroughness and competence of the consulting profession, in accordance

with the standard for professional services at the time those services are rendered. No other warranty or representation, either expressed or implied, is included or intended in its proposals, contracts, or reports.

The implementation of our recommendations for the project will require appropriate testing, construction surveillance and construction-phase monitoring under professional direction of URS.

This report should not be used without prior approval by URS if the nature, size, configuration, location, orientation of the project structures, or project ownership is changed. Furthermore, this report should not be used for any other sites.

-oOo-

URS Corporation has appreciated the opportunity to be of service to you for the proposed STA 5 Flow-way 3 expansion project. Please feel free to contact the undersigned with any questions or comments regarding this report.

Respectfully Submitted,  
**URS Corporation**

Garfield I Wray, P.E.  
Lead Senior Geotechnical Engineer

Fernando Parra, Ph.D., P.E.  
Senior Engineer

**TABLE 1**  
**SUMMARY OF INSITU PERMEABILITY TESTS**  
**SFWMD STA 5 EXPANSION**  
**HENDRY COUNTY, FLORIDA**

Test Location	C1-1	C1-2	C1-3	C2-1	C2-2	C2-3
Depth Interval (ft)	35 - 45	20 - 30	5 - 15	5 - 15	35 - 45	20 - 30
Stratum Tested	Sand, silty, clayey	Limestone	Limestone, clay and sand	Limestone, sandy clay, sand	Silty clayey sand, limestone fragments	Silty clayey sand, limestone fragments
Permeability (ft/day)	0.15	0.09	0.9	0.5	0.2	0.2

TABLE 2A  
SUMMARY OF LABORATORY PHYSICAL TESTING  
SFWMD STA 5 EXPANSION  
HENDRY COUNTY, FLORIDA

Boring ID CB	Sample Depth (ft)		Soil Description	#200 Sieve (%)	Natural Moisture (%)	Atterberg Limits (%)		Organic Content (%)
	From	To				LL	PI	
1	0.0	2.0	Silty sand	18.8	24			
1	4.0	6.0	Sand w/ Clay	7.6	15			
1	6.0	8.0	Sand w/ Clay	8.9	14			
1	8.0	10.0	Sand w/ Clay	8.9	18			
1	13.5	15.0	Clayey sand	18.7	23			
1	18.5	20.0	Clayey sand	24.3	12			
1	28.5	30.0	Clayey sand w/ Limestone	19.0	28			
2	0.0	2.0	Sand	1.3	5			
2	2.0	4.0	Sand	1.0	6			
2	6.0	8.0	Sand	0.9	15			
2	13.5	15.0	Clayey sand	15.3	33			
2	18.5	20.0	Clayey sand	26.9	33			
3	6.0	8.0	Sand	2.1	20			
3	8.0	10.0	Sand	1.6	20			
3	18.5	20.0	Sand, with clay/rock fragments	9.2	27			
4	4.0	6.0	Sand	4.8	15			
4	8.0	10.0	Sand, with clay/rock fragments	6.5	15			
4	13.5	15.0	Sand with clay	10.8	19	23	5	
4	18.5	20.0	Clayey sand	16.7	23			
4	23.5	25.0	Clayey sand	14.2	22			
5	8.0	10.0	Sand with silt	9.0	17			
5	13.5	15.0	Sand, silty with rock fragments	5.2	26			
5	18.5	20.0	Sand, clayey with rock fragments	21.1	19			
6	2.0	4.0	Sand	3.1	13			
6	8.0	10.0	Clayey sand	13.7	16			
6	13.5	15.0	Clayey sand	13.4	26			
6	18.5	20.0	Clayey sand	13.5	33			
7	13.5	15.0	Clayey sand	18.0	40			
7	18.5	20.0	Clayey sand	11.3	29			
7	23.5	25.0	Limestone and clayey sand	13.8	27			
8	6.0	8.0	Sand and clay	18.8	22	19	3	
8	8.0	10.0	Limestone and clayey sand	32.3	21			
8	13.5	15.0	Silt		28	28	4	
8	18.5	20.0	Silt		30	31	6	
8	23.5	25.0	Silt		36	36	10	
9	4.0	6.0	Sand	2.9	20			
9	13.5	15.0	Sand with clay	10.4	30			
9	18.5	20.0	Sand with clay	8.6	31			
9	23.5	25.0	Clayey sand	26.3	25			
10	2.0	4.0	Sand	1.1	13			
10	8.0	10.0	Sand, clayey with rock fragments	23.5	16			
11	6.0	8.0	Limestone and clayey sand	19.7	17			
11	13.5	15.0	Limestone and clayey sand	15.1	19			
11	23.5	25.0	Clayey sand	22.7	27			
12	6.0	8.0	Limestone and clayey sand	12.4	14			
12	18.5	20.0	Clayey sand	19.2	27			
13	4.0	6.0	Clayey sand	14.0	16			
13	13.5	15.0	Sand, slightly clayey	2.6	22			
13	23.5	25.0	Clayey sand	18.7	25			
14	6.0	8.0	Limestone and clayey sand	24.3	18			
14	13.5	15.0	Limestone and clayey sand	16.6	13			
14	18.5	20.0	Clay		32	47	22	
14	23.5	25.0	Limestone		39	43	15	
15	2.0	4.0	Sand, slightly clayey	21.0	24			
15	6.0	8.0	Sandy Limestone		15	19	2	

TABLE 2A (CONT'D)  
SUMMARY OF LABORATORY PHYSICAL TESTING  
SFWMD STA 5 EXPANSION  
HENDRY COUNTY, FLORIDA

Boring ID CB	Sample Depth (ft)		Soil Description	- #200 Sieve (%)	Natural Moisture (%)	Atterberg Limits (%)		Organic Content (%)
	From	To				LL	PI	
15	18.5	20.0	Clay		67	121	82	
15	28.5	30.0	Clayey Sand	17.1	21			
16	2.0	4.0	Sand	0.7	19			
16	4.0	6.0	Clayey Sand	13.4	16			
16	6.0	8.0	Clayey Sand	14.0	16			
16	13.5	15.0	Silty Clayey Sand	27.3	19			
17	2.0	4.0	Sandy Silt		18	24	9	
17	4.0	6.0	Clay		12	20	9	
17	18.5	20.0	Clay		27	34	13	
18	2.0	4.0	Sandy clay	54.7	18			
18	13.5	15.0	Clayey Sand	28.7	27			
19	2.0	4.0	Clayey Sand	18.1	23			
20	2.0	4.0	Sand with silt	11.7	48			
20	6.0	8.0	Silty sand	34.9	18			
20	13.5	15.0	Sandy Clay		24	29	9	
21	2.0	2.2	Limestone with Sand	2.4	24			
21	4.0	6.0	Sand with silt	11.5	19			
21	13.5	15.0	Clay		32	27	10	
22	2.0	4.0	Sand	4.4	21			
22	13.5	15.0	Clayey Limestone		23	23	7	
23	4.0	6.0	Clayey Sand	21.8	24			
23	6.0	8.0	Clayey Sand	26.1	17			
23	8.0	10.0	Clayey Sand		24	24	6	
23	13.5	15.0	Clay		36	25	4	
24	6.0	8.0	Clayey Sand	24.3	15			
24	8.0	10.0	Clay with Sand	53.8	18			
25	2.0	4.0	Limestone and Clayey Sand	12.7	14			
25	4.0	6.0	Limestone and Clayey Sand		15	26	6	
26	0.0	2.0	Silt	30.7	9	25	5	
26	4.0	6.0	Clayey Sand	18.8	14			
28	18.5	20.0	Clayey Sand	13.9	22			
29	8.0	10.0	Limestone		16	19	3	
30	6.0	8.0	Clayey Sand	25.5	16			
30	13.5	15.0	Clayey Sand	24.0	15			
31	4.0	6.0	Limestone and Peat					7
32	6.0	8.0	Clayey Sand	29.7	27			
32	13.5	15.0	Clay	52.2	17	25	7	
33	8.0	10.0	Clayey Sand	28.4	12			
33	13.5	15.0	Clayey Sand	29.9	17			
34	2.0	4.0	Peat		227			53
34	4.0	6.0	Peat		202			34
34	6.0	8.0	Limestone and Silty Sand		21	23	5	
35	6.0	8.0	Peat		459			79
35	8.0	10.0	Peat and Silty Clay		68			9
35	13.5	15.0	Limestone and Clay		22	26	10	
35	23.5	25.0	Clay		21	27	7	
36	4.0	6.0	Peat		32			6
36	18.5	20.0	Limestone and Clayey Sand		25	29	3	
36	23.5	25.0	Limestone and Clayey Sand	12.5	18			

**TABLE 2B**  
**SUMMARY OF LABORATORY CHEMICAL TESTING**  
**SFWMD STA 5**  
**HENDRY COUNTY, FLORIDA**

<b>BOREHOLE</b>	<b>DEPTH</b>	<b>pH</b>	<b>Chlorides</b>	<b>Sulfates</b>	<b>Resistivity</b>
<b>CB-</b>	<b>(ft)</b>		<b>(ppm)</b>	<b>(ppm)</b>	<b>(Ohms-cm)</b>
1	4-6	8.2	90	87.9	
1	8-10	8.1	90	94.5	
2	0-2	7.1	105	67.5	
2	4-6	6.9	75	60	
2	13.5-15.0	7.7	90	75.3	
3	2-4	7.2	105	63.6	
4	2-4	4.7	105	105.6	
4	13.5-15.0	7.7	105	90	
5	0-2				1500
6	13.5-15.0	6.6	90	102	
8	4-6	8.4	90	98.4	
8	8-10	8.4	90	71.1	
10	6-8				1700
13	6-8				1300
35	6-8	7.1	120	95.1	
35	13.5-15.0	7.9	90	87.9	
36	0-2	7.8	105	107.7	
36	2-4	8	90	62.6	
43	18.5-20.0	8.4	90	117.9	

**TABL- 2C**  
**SUMMARY OF LABORATORY COMPACTION TESTING**  
**SFWMD STA 5**  
**HENDRY COUNTY, FLORIDA**

LOCATION		MATERIAL	MAX. DRY UNIT WEIGHT (pcf)	OPTIMUM WATER CONTENT (%)
STA5-3B.	Southern border, approximately 300 feet from eastern most side of cell	Brown fine sand with limestone fragments and organic matter	81.3	23.5
STA5-3B.	Southern border, approximately 450 feet from eastern side of cell	Brown fine sand with scarce limestone fragments	114.3	8.5
STA5-3B.	Southern border, approximately 4250 feet from eastern side of cell	Brown fine sand with limestone fragments	94.5	22
STA5-Section 2.	Northern border, approximately 450 feet from eastern side of cell	Brown fine sand with scarce limestone fragments, and organics	103.5	17.5
STA5-Section 2.	Southern border, approximately 2050 feet from eastern side of cell	Brown fine sand with scarce limestone fragments, and organics	106.8	16

**TALUE 3**  
**SUMMARY OF STRENGTH PARAMETERS**  
**STA-5 EXPANSION**  
**HENDRY COUNTY, FLORIDA**

BORING	SOIL TYPE	AVERAGE SPT "N-VALUE"	GROUND SURFACE ELEVATION (ft)		GROUND WATER ELEVATION (ft)	UNIT WEIGHT (Lb/ft3)		END OF CONSTRUCTION / RAPID DRAWDOWN CONDITION	
			From	To		Moist	Saturated	Su (psf)	φ
STA 5									
CB-12	FILL	8 <sup>(1)</sup>	20.5	12.0	8.0	115	122	350	0
	SAND W/ SOME SILT	8	12.0	8.0		105	110	0	30
	LIMESTONE AND SAND	10	8.0	-6.0		133	135	0	35
	CLAYEY SAND	8	-6.0	-18.0		105	110	500	0
CB-16	FILL	8 <sup>(1)</sup>	20.5	12.0	8.0	115	122	350	0
	MUCK	1 <sup>(2)</sup>	12.0	10.0		65	68	200	0
	CLAYEY SAND	9	10.0	-6.0		105	110	600	0
	CLAY	5	-6.0	-11.0		110	120	500	0
	CLAYEY SAND	23	-11.0	-18.0		110	115	1500	0
CB-33	FILL	8 <sup>(1)</sup>	20.5	10.0	8.0	115	122	350	0
	SAND W/ SOME SILT	9	10.0	5.0		100	105	0	28
	CLAYEY SAND	66	5.0	1.0		115	120	2500	0
	CLAYEY SAND	11	1.0	-4.0		105	110	800	0
	CLAYEY SAND	28	-4.0	-14.0		110	115	1500	0
TB-3	CLAYEY SAND	11	-14.0	-19.0	8.0	105	110	800	0
	FILL	8 <sup>(1)</sup>	20.5	10.0		115	122	350	0
	MUCK	6	10.0	8.0		65	68	200	0
	SAND W/ SOME SILT	26	8.0	4.0		110	115	0	32
	SAND W/ SOME SILT, SHELL	6	4.0	-18.0		100	105	0	29
TB-21	FILL	8 <sup>(1)</sup>	20.5	12.0	8.0	115	122	350	0
	MUCK	4	12.0	6.0		65	68	200	0
	SAND W/ SOME SILT	10	6.0	0.0		115	120	0	30
	CLAY	10	0.0	-5.0		105	110	800	0
	SAND W/ SOME SILT, SHELL	36	-5.0	-18.0		105	110	0	34

- (1) Permeability values taken from Stormwater Treatment Area 6 - Everglades Construction Project - Seepage Analysis Report, March 5, 1997, Montgomery Watson Americas, Inc.  
(2) Horizontal permeability taken as the mid-range value from the permeability range for muck materials published in the U.S. Department of Agriculture - Soil Survey for Hendry County, Florida  
(3) Assumes hydraulic conductivity for compacted muck material underneath the levee equal to  $K_h = 0.1$  ft/day and  $K_v = 0.05$  ft/day

**TABLE 3 (CONT'D)**  
**SUMMARY OF SOIL CONDUCTIVITY PARAMETERS**  
**SFWMD STA 5 EXPANSION**  
**HENDRY COUNTY, FLORIDA**

BORING	SOIL TYPE	GROUND SURFACE ELEVATION (ft)		UNIT WEIGHT (Lb/ft3)		GROUND WATER ELEVATION (ft)
		From	To	Moist	Saturated	
STA 5						
CB-12	FILL	20.5	12.0	115	122	8.0
	SAND W/ SILT TO SILTY SAND	12.0	8.0	105	110	
	LIMESTONE AND SAND	8.0	-6.0	133	135	
	CLAYEY SAND	-6.0	-18.0	105	110	
CB-28	FILL	20.5	12.0	115	122	11.0
	MUCK	12.0	8.0	65	68	
	LIMESTONE AND SAND	8.0	2.0	138	140	
	SAND	2.0	-12.0	105	110	
	CLAYEY SAND	-12.0	-18.0	105	110	
CB-33	FILL	20.5	10.0	115	122	8.0
	SAND W/ SILT TO SILTY SAND	10.0	5.0	100	105	
	CLAYEY SAND	5.0	-19.0	115	120	

- (1) Permeability values taken from Stormwater Treatment Area 6 - Everglades Construction Project - Seepage Analysis Report, March 5, 1997, Montgomery Watson Americas, Inc.  
(2) Horizontal permeability taken as the mid-range value from the permeability range for muck materials published in the U.S. Department of Agriculture - Soil Survey for Hendry County, Florida  
(3) Assumes hydraulic conductivity for compacted muck material underneath the levee equal to  $K_h = 0.1$  ft/day and  $K_v = 0.05$  ft/day

**TABLE 4**  
**COMPARISON OF SOIL PARAMETERS**  
**STABILITY ANALYSES**  
**SFWMD STA 2, STA 5, & STA 6**  
**HENDRY COUNTY, FLORIDA**

Soil Type	Unit Weight (lb/ft <sup>3</sup> )		Strength Parameters			
	Moist	Saturated	End of Construction/Rapid Drawdown		Steady State	
			c (psf)	Φ (deg)	c (psf)	Φ (deg)
STA 2						
Fill	-	-	350	0	100	33
Peat	-	-	250	0	150	20
Limestone	-	-	0	45	0	45
STA 5						
Fill	115	122	350	0	100	33
Peat/Muck	65	68	200	0	100	15
Limestone	138	140	0	45	0	45
Sand (SP)	105	110	0	30	0	30
STA 6 -- (1995)						
Fill	115	122	350	0	100	33
Peat/Muck	65	68	200	0	100	15
Limestone	138	140	0	45	0	45
Sand (SP)	105	110	0	30	0	30
STA 5 -- (2005)						
Fill	115	122	350	0	100	32
Muck	65	68	200	0	100	15
Limestone	128 & 133	130 & 135	0	32, 35	0	32, 35
Sand, with silt or shell	105 & 110	110 & 120	0	28, 29, 32 & 34	0	28, 29, 32 & 34
Clayey Sand	105 & 110	110 & 115	500, 600, 800, 1500	0	100	20, 28, 30, 32

**TABLE 5**  
**COMPUTED SEEPAGE QUANTITIES**  
**STA-5 FLOW-WAY 3 EXPANSION**  
**HENDRY COUNTY, FLORIDA**

Location	Seepage Flow (ft <sup>3</sup> /day-linear foot)	
	with key ditch	without key ditch
CB-12	-	1.5
CB-28	7.5	10.6
CB-33	-	2.1

**TABLE 6**  
**SUMMARY OF EMBANKMENT SATCBILITY ANALYSES**  
**SFWMD STA 5 EXPANSION**  
**HENDRY COUNTY, FLORIDA**

CONDITION	MINIMUM SAFETY FACTOR, FS <sub>min</sub>					REQUIRED MINIMUM SAFETY FACTOR	REMARKS
	CB-12	CB-16	CB-33	TB-3	TB-21		
END OF CONSTRUCTION	1.6	2.0	2.1	1.8 <sup>(2)</sup>	1.7	1.2	OK
STEADY STATE	1.8	1.7	1.6	1.5	1.7	1.5	OK
RAPID DRAWDOWN	1.7	1.9	1.6	1.6	1.4	1.2	OK

Note: Analysis performed using Janbu Modified Method  
(2) Rankine Block Method



**Legend**

- Approximate URS Boring Location (2005)
- Approximate URS Field Permeability Cluster (2005)
- △ Approximate NODARSE Boring Location (1996)

Scale: 1"=2000'



**URS**  
100 CONGRESS AVENUE SUITE 200  
BOCA RATON, FL 33432  
PHONE (561) 994-6200  
FAX (561) 994-6334  
CERT. OF AUTHORIZATION NO. 1213

South Florida Water Management District  
Contract CN040936-W005, STA-5 Flow-way 3  
Basis of Design Report

# **APPENDIX A**

## **BORING LOGS**

**URS**

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=673819.01(E),Y=762458.94(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0001			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/16/2004 : 11/16/2004	
8. DEPTH DRILLED INTO ROCK 5.0 Ft.			17. ELEVATION TOP OF BORING +15.9 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+15.9	0.0		SILTY SAND, fine, brown to gray to tan, trace shell, trace limestone fragments ( SM ) (-200=18.8%, w=24%)	33	1		SPT Sampler	8 8 6	14
+12.4	3.5		SAND, brown, trace shell ( SP-SC ) (-200=7.6%, w=15%)	44	2		SPT Sampler	6 6 5	11
			Tan, clayey ( SP-SC ) (-200=8.9%, w=14%)	222	3		SPT Sampler	8 7 7	14
			Brown (-200=8.9%,w=18%) (SP-SC )	50	4		SPT Sampler	3 5 5	10
			White to light gray, clayey, with shell fragments (-200=18.7%, w=23%) (SC)	67	5		SPT Sampler	3 6 5	11
			(-200=24.3%, w=12%) (SC)	100	6		SPT Sampler	4 4 3	7
-7.6	23.5		LIMESTONE, gray, sandy, shell fragments (LS)	89	7		SPT Sampler	6 11 13	24
-12.6	28.5		SAND, gray, clayey, with limestone fragments (SC)	67	9		SPT Sampler	4 3 2	5
-14.1	30.0		BORING TERMINATED AT 30 FEET ON 11/16/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=673833.60(E), Y=760446.90(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0002			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 11.6ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED 11/17/2004 : 11/17/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +17.6 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 Ft.	N- VALUE	
+17.6	0.0		SAND, fine, dark brown, silty (-200=1.3%, w=5%) (SP)	42	1		SPT Sampler	5	14	0.0
			Brown yellow interbedded with tan yellow (-200=1%, w=6%) (SP) Gray to dark gray to brown gray	100	2		SPT Sampler	5	12	2.5
			Tan, fine, to dark brown black (-200=0.9%, w=15%) (SP) Brown to tan	75	3		SPT Sampler	7	14	5.0
			Medium, white to gray Green, clayey	75	4		SPT Sampler	12	18	7.5
				100	5		SPT Sampler	8	20	10.0
								11		
								10		
										12.5
			(-200=15.3%, w=33%) (SC) Gray to light gray	89	6		SPT Sampler	3	5	15.0
								2		
								3		
										17.5
			Dark gray, clayey, trace shell (-200=26.9%, w=33%) (SC)	89	7		SPT Sampler	2	5	20.0
								1		
								4		
										22.5
				100	8		SPT Sampler	5	9	25.0
								4		
								5		
										27.5
				100	9		SPT Sampler	4	11	30.0
								4		
								7		
-12.4	30.0		BORING TERMINATED AT 30 FEET ON 11/17/2004							

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=673829.43(E),Y=758624.56(N)			11. COORDINATE SYSTEM/DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0003			13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 10.8ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING STARTED : 11/17/2004 COMPLETED : 11/17/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +17.6 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+17.6	0.0		SAND, fine, light brown to dark brown, silty (SP)	83	1		SPT Sampler	5	12
			Brown to tan to gray				+15.6	5	
			Dark brown to light gray to white	63	2		SPT Sampler	6	8
							+13.6	4	
			Gray to light gray	75	3		SPT Sampler	14	23
							+11.6	12	
			Light brown to gray to dark brown (-200=2.1%, w=20%) (SP)	83	4		SPT Sampler	11	
							+9.6	8	
			Brown to dark brown (-200=1.6%, w=20%) (SP)	100	5		SPT Sampler	6	11
							+7.6	6	
			Dark brown						
			Tan to light brown, clayey, trace shell	67	6		SPT Sampler	5	15
							+2.6	7	
								8	
			Olive green to tan, with rock fragments, pebbles (-200=9.2%, w=27%) (SP-SC)	100	7		SPT Sampler	3	4
							-2.4	2	
								2	
			Olive to light brown Olive, without pebbles (SP)	100	8		SPT Sampler	1	3
							-7.4	1	
								2	
			Olive gray, calcareous, abundant shell fragments, pebbles	100	9		SPT Sampler	3	7
							-12.4	4	
								3	
-12.4	30.0		BORING TERMINATED AT 30 FEET ON 11/17/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=673832.84(E),Y=757820.47(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0004			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 12.7ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/17/2004 : 11/17/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +18.7 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+18.7	0.0		SAND, gray to dark brown sand, silty, rock fragments (road fill) (SP)	100	1		SPT Sampler	9	15
			Dark brown	67	2		SPT Sampler	7	11
			Fine, gray to dark brown (-200=4.8%, w=15%) Gray to white Dark brown (SC)	75	3		SPT Sampler	6	11
			Light brown to gray	83	4		SPT Sampler	7	13
			Brown, trace shell fragments Dark brown to brown, with limestone fragments (-200=6.5%, w=15%) (SP-SM) Brown	100	5		SPT Sampler	8	15
			Dark brown Gray to olive green						
+4.7	14.0		(-200=10.8%, w=19%, LL=23%, PI=5%) (SP-SM) Medium to fine, tan, trace shell CLAYEY SAND, gray to light green	89	6		SPT Sampler	7	16
			White to light gray, trace shell (-200=16.7%, w=23%) (SC)	100	7		SPT Sampler	2	4
			Gray, sand (-200=14.5%, w=22%) (SC)	100	8		SPT Sampler	5	14
-9.8	28.5		SILT, olive to tan, clayey, with abundant shell fragments, pebbles, medium stiff (ML)	100	9		SPT Sampler	2	7
-11.3	30.0		BORING TERMINATED AT 30 FEET ON 11/17/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
LOCATION COORDINATES FLORIDA X=674845.75(E),Y=757827.75(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0005			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 13.3ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/17/2004 : 11/17/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +15.5 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 F.	N- VALUE
+15.5	0.0		SAND, dark brown, silty (SP-SM) Fine, brown	75	1		SPT Sampler	3	9
				50	2		SPT Sampler	10	24
			Medium to fine, trace rock					14	
			Brown to dark brown	50	3		SPT Sampler	5	8
								4	
			Medium, dark brown	75	4		SPT Sampler	8	23
			Red brown to white to light gray to gray, clayey					13	
			Olive gray to light green to gray, trace shell (-200=9%, w=17%) (SP-SM)	75	5		SPT Sampler	5	16
								7	
								9	
								12	
				67	6		SPT Sampler	2	5
			Light gray, with rock, pebbles and shell (-200=5.2%, w=26%) (SP-SM)					3	
								2	
				44	7		SPT Sampler	8	16
			CLAYEY SAND, light gray, with limestone and shell fragments (-200=21.1%, w=19%) (SC)					10	
								6	
				100	8		SPT Sampler	2	6
			Light brown, fine, silty, trace limestone fragments					3	
								3	
				100	9		SPT Sampler	8	31
			Gray					18	
								13	
			BORING TERMINATED AT 30 FEET ON 11/17/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=675859.80(E),Y=757822.51(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0006			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 13 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/17/2004 : 11/17/2004	
8. DEPTH DRILLED INTO ROCK 4.0 Ft.			17. ELEVATION TOP OF BORING +15.0 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+15.0	0.0		SAND, medium, light brown, with shell, with rock (SP) (FILL)	100	1		SPT Sampler	7	13	0.0
							+13.0	6		
			Fine to medium, tan to white to light brown (-200=3.1%, w=13%) (SP)	83	2		SPT Sampler	7	18	2.5
			Dark brown, silty				+11.0	8		
			Medium, tan to light brown	83	3		SPT Sampler	11	29	5.0
			Brown to dark brown to black				+9.0	10		
			Light brown, clayey	50	4		SPT Sampler	9	5	7.5
+7.0	8.0						+7.0	3		
			CLAYEY SAND, yellow tan (-200=13.7%, w=16%) (SC)	67	5		SPT Sampler	2	13	10.0
							+5.0	4		
								9		12.5
								10		15.0
			Olive tan (-200=13.4%, w=26%) (SC)	83	6		SPT Sampler	5	12	17.5
							0.0	6		20.0
								6		22.5
			Olive gray (-200=13.5%, w=33%) (SC)	100	7		SPT Sampler	2	4	25.0
							-5.0	2		27.5
								2		30.0
-9.5	24.5		Light gray to white gray, weathered limestone and shell	83	8		SPT Sampler	0	11	
			LIMESTONE (LS)				-10.0	0		
								11		
-13.5	28.5									
			CLAYEY SAND, tan to light gray, with rock fragments (SC)	100	9		SPT Sampler	5	12	
							-15.0	6		
-15.0	30.0							6		
			BORING TERMINATED AT 30 FEET ON 11/17/2004							

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=676864.21(E),Y=757824.01(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED NAD83 NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0007			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED 9 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 11.5ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED 11/18/2004 11/18/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +15.0 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+15.0	0.0		SAND, dark brown to brown, silty (SP)	50	1		SPT Sampler	5	16	0.0
			Dark brown to black	75	2		SPT Sampler	8	18	2.5
			Light brown					10		
			Dark brown	75	3		SPT Sampler	8	16	5.0
			Fine, brown					8		
			Medium, tan to light gray	58	4		SPT Sampler	4	11	7.5
			Light gray					5		
			Light gray to gray olive, clayey	83	5		SPT Sampler	7	15	10.0
								8		
								7		
								10		
+1.5	13.5		CLAYEY SAND, gray with trace shell (-200=18%, w=40%) (SC)	100	6		SPT Sampler	3	7	15.0
								3		
								4		
			(-200=11.3%, w=29%) (SP-SC)	100	7		SPT Sampler	2	7	20.0
								3		
								4		
-8.5	23.5		LIMESTONE AND SAND, gray, slightly clayey, and weathered limestone fragments (-200=13.8%, w=27%) (SC-LS)	100	8		SPT Sampler	3	10	25.0
								5		
								5		
			Some clay, trace shell	100	9		SPT Sampler	5	17	30.0
								7		
								10		
-15.0	30.0		BORING TERMINATED AT 30 FEET ON 11/18/2004							

DRILLING LOG		DIVISION		INSTALLATION		SHEET 1 OF 1 SHEET		
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN				10. SIZE AND TYPE OF BIT See remarks				
2. LOCATION COORDINATES FLORIDA X=676174.02(E), Y=760460.10(N)				11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED NAD83 : NGVD29				
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES				12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53				
4. BORING DESIGNATION CP05-STA5N-CB-0008				13. TOTAL SAMPLES : DISTURBED : UNDISTURBED 9 : 0				
5. NAME OF DRILLER JOHN				14. TOTAL NUMBER CORE BOXES 0				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER 10.4ft.				
7. THICKNESS OF OVERBURDEN N/A Ft.				16. DATE BORING : STARTED : COMPLETED 12/9/2004 : 12/9/2004				
8. DEPTH DRILLED INTO ROCK N/A Ft.				17. ELEVATION TOP OF BORING +14.4 Ft.				
9. TOTAL DEPTH OF HOLE 30.0 Ft.				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS BLOWS/ 0.5 FT	N VALUE
+14.4	0.0		SAND, fine, dark brown to brown to yellow (SP) brown	50	1		SPT Sampler 4 5 6 5	11
+12.4	2.0		SAND AND PEAT, medium, dark brown, silty, with peat (SP-PT)	75	2		SPT Sampler 2 5 6 5	11
+10.4	4.0		SAND, fine, brown ( SP)	50	3		SPT Sampler 2 3 5 3	8
+8.4	6.0		CLAY, brown, sandy, silty, with weathered limestone, very stiff (-200=18.8%, w=22%, LL=19%, PI=3%) (CL-LS)	100	4		SPT Sampler 4 6 8 10	14
+6.4	8.0		LIMESTONE AND CLAYEY SAND, tan, (LS-SC) sandy, weathered limestone	100	5		SPT Sampler 4 3 3 4	6
+4.4	10.0		SILT, light gray, clayey, soft					
			(w=28%, LL=28%, PI=4%) (ML)	100	6		SPT Sampler 1 1 2	3
			Gray (w=30%, LL=31%, PI=6%) (ML)	100	7		SPT Sampler 1 2 2	4
			(w=36%, LL=36%, PI=10%) (ML)	100	8		SPT Sampler 2 1 2	3
			Slightly sandy, stiff	100	9		SPT Sampler 4 5 7	12
-15.6	30.0		BORING TERMINATED AT 30 FEET ON 12/9/2004					

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=677873.27(E),Y=757822.49(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0009			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 10.8ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK 1.5 Ft.			17. ELEVATION TOP OF BORING +14.8 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+14.8	0.0		SAND, medium, brown, with rock fragments (FILL)	100	1		SPT Sampler	6	11	0.0
							+12.8	5		
			Fine, brown to light brown to tan and black to dark brown	67	2		SPT Sampler	7	18	2.5
			(-200=2.9%, w=20%) (SP)				+10.8	9		
			Tan to white to black to dark brown, silty	100	3		SPT Sampler	9		5.0
			Light brown to brown				+8.8	6	13	
			Yellow brown to dark brown	50	4		SPT Sampler	7		
			Light brown to tan				+6.8	4	10	7.5
			White, with limestone fragments, trace shell	75	5		SPT Sampler	6		
			Clayey				+4.8	10	19	10.0
								7		
										12.5
+1.3	13.5		CLAYEY SAND, light gray, with limestone fragments	78	6		SPT Sampler	2	4	15.0
			(-200=10.4%, w=30%) (SP-SC)				-0.2	2		
										17.5
			Gray (-200=8.6%, w=31%)	100	7		SPT Sampler	1		
							-5.2	1	2	20.0
										22.5
			With trace shell (-200=26.3%, w=25%) (SC)	100	8		SPT Sampler	2		
							-10.2	2	6	25.0
								4		
										27.5
-13.7	28.5		LIMESTONE, gray, weathered, with clay (LS)	100	9		SPT Sampler	10		
			Without clay				-15.2	9	20	30.0
-15.2	30.0		BORING TERMINATED AT 30 FEET ON 12/9/2004					11		

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=678859.85(E), Y=757824.48(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0010			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 9.7 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK 1.5 Ft.			17. ELEVATION TOP OF BORING +13.7 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+13.7	0.0		SAND, dark brown to brown, silty	83	1		SPT Sampler	5	15	0.0
			(-200=1.1%, w=13%) (SP)	67	2		SPT Sampler	6	15	2.5
				67	3		SPT Sampler	5	10	5.0
+7.7	6.0		Medium to fine, brown				SPT Sampler	4	19	7.5
			CLAYEY SAND, brown tan to greenish gray	100	4		SPT Sampler	6	10	10.0
			Brown, with rock, trace shell (-200=23.5%, w=16%) (SC) White gray, with rock fragments	100	5		SPT Sampler	5		
+1.7	12.0							3		
			LIMESTONE AND SAND, gray to light gray, weathered limestone, trace clay, with shell (LS-SP)	67	6		SPT Sampler	6	8	12.5
								5		15.0
								3		
-4.8	18.5		LIMESTONE, gray, weathered, with shell (LS)	100	7		SPT Sampler	4	27	17.5
			Dark gray, trace clay					11		20.0
-6.3	20.0		LIMESTONE AND SAND, pebble to coarse, gray, clayey, weathered (LS-SP)					16		
				67	8		SPT Sampler	8	18	22.5
								10		25.0
								8		
				100	9		SPT Sampler	11	21	27.5
								9		
-16.3	30.0		Tan, with shell					12		30.0
			BORING TERMINATED AT 30 FEET ON 12/9/2004							

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=679881.24(E),Y=757817.89(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0011			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 9.8 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +13.3 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+13.3	0.0		CLAYEY SAND, brown, with shell (SC)	83	1		SPT Sampler	6	16
+11.3	2.0		Brown to dark brown, silty Medium, tan	75	2		SPT Sampler	9	18
			SAND, fine, light brown (SP)	88	3		SPT Sampler	6	21
+7.3	6.0		Medium, light brown to brown Brown to dark brown	75	4		SPT Sampler	2	8
+5.3	8.0		CLAYEY SAND, dark greenish gray, sandy, with shell (-200=19.7%, w=17%) (SC)	100	5		SPT Sampler	5	15
			LIMESTONE AND CLAYEY SAND, gray olive, weathered limestone, with shell, with limestone pebbles (LS-SP)	100	6		SPT Sampler	11	16
								9	
								7	
								3	7
			White to light gray, with rock fragments	100	7		SPT Sampler	3	7
								4	
								3	
								2	7
			CLAYEY SAND, tan to light brown, trace shell (-200=22.7%, w=27%) (SC)	100	8		SPT Sampler	3	7
								4	
								2	5
			Gray to dark gray	100	9		SPT Sampler	2	5
								2	
								3	
			BORING TERMINATED AT 30 FEET ON 12/9/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=680888.14(E),Y=757817.38(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0012			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 9 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK 7.0 Ft.			17. ELEVATION TOP OF BORING +12.0 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+12.0	0.0		SAND, fine, brown to dark brown black, silty, trace shell (SP)	58	1		SPT Sampler	6	10	0.0
							+10.0	4		
			Brown to tan	83	2		SPT Sampler	6	7	2.5
+8.0	4.0						+8.0	4		
			LIMESTONE, brown to tan, weathered, with shell, some clay (LS)	100	3		SPT Sampler	2	5	5.0
+6.0	6.0						+6.0	3		
			LIMESTONE AND SAND, gray, weathered, with shell (-200=12.4%, w=14%) (LS-SC)	50	4		SPT Sampler	7	16	7.5
			Clayey sand				+4.0	6		
			Coarse to medium, gray to tan	75	5		SPT Sampler	3	6	10.0
							+2.0	3		
								6		
-1.5	13.5									12.5
			LIMESTONE, white to light gray, clayey, (LS) weathered, trace shell	100	6		SPT Sampler	7	12	15.0
							-3.0	6		
										17.5
-6.5	18.5									
			CLAYEY SAND, fine, gray (-200=19.2%, w=27%) (SC)	100	7		SPT Sampler	2	5	20.0
							-8.0	3		
								2		22.5
			With shell	100	8		SPT Sampler	2	8	25.0
							-13.0	4		
								4		27.5
			Trace shell	100	9		SPT Sampler	2	8	30.0
							-18.0	4		
-18.0	30.0		BORING TERMINATED AT 30 FEET ON 12/9/2004							

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>	<b>SHEET</b> 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN		10. SIZE AND TYPE OF BIT See remarks		
2. LOCATION COORDINATES FLORIDA X=681888.77(E),Y=757817.00(N)		11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29		
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES		12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53		
4. BORING DESIGNATION CP05-STA5N-CB-0013		13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0		
5. NAME OF DRILLER JOHN		14. TOTAL NUMBER CORE BOXES 0		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 8.7 Ft.		
7. THICKNESS OF OVERBURDEN N/A Ft.		16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004		
8. DEPTH DRILLED INTO ROCK N/A Ft.		17. ELEVATION TOP OF BORING +12.2 Ft.		
9. TOTAL DEPTH OF HOLE 30.0 Ft.		18. TOTAL CORE RECOVERY FOR BORING N/A %		
		19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+12.2	0.0		SAND, fine, brown to dark brown to black, silty (SP)	58	1		SPT Sampler	5	12	0.0
				58	2		SPT Sampler	2	22	2.5
			Tan, clayey, with shell (-200=14%, w=16%) (SC)	75	3		SPT Sampler	6	14	5.0
			Coarse to medium, tan olive clayey, with shell	100	4		SPT Sampler	6	18	7.5
			Coarse, tan, trace shell, limestone fragments	100	5		SPT Sampler	7	9	10.0
								7		12.5
			Coarse, gray, slightly clayey, and shell (-200=2.6%, w=22%) (SP)	100	6		SPT Sampler	4	28	15.0
								15		17.5
								13		20.0
			Medium to fine, slightly clayey, with pebble limestone	100	7		SPT Sampler	7	13	22.5
								6		25.0
								7		27.5
-11.3	23.5		CLAYEY SAND, gray, trace shell, and rock (-200=18.7%, w=25%) (SC)	67	8		SPT Sampler	4	7	30.0
								3		
								4		
-17.8	30.0		BORING TERMINATED AT 30 FEET ON 12/9/2004	100	9		SPT Sampler	3	8	
								4		
								4		

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=682902.53(E),Y=757817.55(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0014			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 8.2 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK 9.5 Ft.			17. ELEVATION TOP OF BORING +11.7 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+11.7	0.0		SAND, brown, clayey, silty, with rock and shell pebbles	83	1		SPT Sampler	4	0.0
+10.2	1.5		Dark brown to brown LIMESTONE, gray, with shell, trace clay (LS)	56	2		+10.4 SPT Sampler	5 50/4"	>50
+7.2	4.5		Coarse, tan yellow, with sand, weathered, trace shell	100	3		+9.4 SPT Sampler	50/3.5"	>50
+5.7	6.0		SAND WITH CLAY, coarse, tan, silty (SC)				SPT Sampler	6 9 12	21
			LIMESTONE AND CLAYEY SAND, yellow tan, weathered, trace shell (-200=24.3%, w=18%) (LS-SC)	75	4		+5.7 SPT Sampler	10 6 5	11
			Coarse to medium, tan to gray	83	5		+3.7 SPT Sampler	7 8 6 6	12
							+1.7	6	
-1.8	13.5		LIMESTONE AND SAND, tan to yellow to gray, trace shell, weathered (-200=16.6%, w=13%) (LS-SC)	100	6		SPT Sampler	9 13 10	23
-6.8	18.5		Coarse to medium, white to light gray, clayey						
			CLAY, bluish green, trace shell, trace rock, weathered, soft (w=32%, LL=47%, PI=22%) (CL)	100	7		SPT Sampler	2 2 2	4
-11.8	23.5		LIMESTONE, dark gray, clayey, weathered, calcareous (w=39%, LL=43%, PI=15%) Slightly clayey, abundant shell (LS)	100	8		SPT Sampler	3 7 13	20
-16.8	28.5		LIMESTONE, gray, slightly clayey, weathered (LS)	78	9		SPT Sampler	11 11 12	23
-18.3	30.0		BORING TERMINATED AT 30 FEET ON 12/9/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=683907.04(E), Y=757813.95(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0015			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 6.5 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK 19.5 Ft.			17. ELEVATION TOP OF BORING +12.5 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT -	N- VALUE
+12.5	0.0		SAND, tan gray, clayey, with limestone, with shell (fill) (-200=21%, w=24%) (SC)	75	1		SPT Sampler	21	23
+10.5	2.0		Coarse to medium, tan yellow, with rock					14	
								9	
			SAND WITH CLAY, dark brown, silty (SP-SC)	67	2		SPT Sampler	3	13
			Brown to yellow, clayey, trace rock					5	
								8	
+8.5	4.0		LIMESTONE, tan to yellow, clayey, weathered (LS)	67	3		SPT Sampler	10	16
								9	
								7	
			Sandy (w=15%, LL=19%, PI=2%)	67	4		SPT Sampler	5	20
								7	
								13	
			Yellow to light gray	67	5		SPT Sampler	22	30
								14	
								14	
								16	
								28	
			Brown to white	100	6		SPT Sampler	9	9
			White to light gray, calcareous					5	
								4	
-6.0	18.5		Gray to tan, and shell	100	7		SPT Sampler	2	5
			CLAY, bluish green, trace shell, medium stiff (w=67%, LL=121%, PI=82%) (CL)					3	
								2	
-11.0	23.5		LIMESTONE, dark gray, clayey, weathered, calcareous, slightly clayey (LS)	67	8		SPT Sampler	5	26
								12	
								14	
-16.0	28.5		CLAYEY SAND, fine, gray, silty, trace rock (-200=17.1%, w=21%) (SC)	100	9		SPT Sampler	4	14
								5	
								9	
-17.5	30.0		BORING TERMINATED AT 30 FEET ON 12/9/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=684932.83(E), Y=757817.45(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0016			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 7.9 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/23/2004 : 11/23/2004	
8. DEPTH DRILLED INTO ROCK 2.0 Ft.			17. ELEVATION TOP OF BORING +11.9 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+11.9	0.0		LIMESTONE, brown (2-inch fill)	8	1		SPT Sampler	9	7
+9.9	2.0		SAND, fine, brown to dark brown, trace organic (-200=0.7%, w=19%) (SP)	100	2		SPT Sampler	2	8
			Brown, clayey, with limestone fragments (-200=13.4%, w=16%) (SC)	100	3		SPT Sampler	1	4
			Gray (-200=14%, w=16%) (SC)	67	4		SPT Sampler	4	15
				67	5		SPT Sampler	3	10
								5	
								6	
			Silly, trace shell (-200=27.3%, w=19%) (SC)	100	6		SPT Sampler	4	8
								4	
								4	
-6.6	18.5		CLAY, green, trace shell, medium stiff (CL)	67	7		SPT Sampler	5	5
								3	
								2	
-11.6	23.5		SAND, fine, greenish gray, with clay, trace shell (SP)	67	8		SPT Sampler	11	27
								14	
								13	
			Trace limestone fragments	89	9		SPT Sampler	8	20
								10	
								10	
-18.1	30.0		BORING TERMINATED AT 30 FEET ON 11/23/2004						

DRILLING LOG		DIVISION		INSTALLATION		SHEET 1 OF 1 SHEET	
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN				10. SIZE AND TYPE OF BIT See remarks			
2. LOCATION COORDINATES FLORIDA X=685931.62(E), Y=757814.94(N)				11. COORDINATE SYSTEM/DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29			
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES				12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53			
4. BORING DESIGNATION CP05-STA5N-CB-0017				13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0			
5. NAME OF DRILLER JOHN				14. TOTAL NUMBER CORE BOXES 0			
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER 8.4 Ft.			
7. THICKNESS OF OVERBURDEN N/A Ft.				16. DATE BORING STARTED : 11/20/2004 COMPLETED : 11/20/2004			
8. DEPTH DRILLED INTO ROCK 12.5 Ft.				17. ELEVATION TOP OF BORING +11.9 Ft.			
9. TOTAL DEPTH OF HOLE 30.0 Ft.				18. TOTAL CORE RECOVERY FOR BORING N/A %			
				19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+11.9	0.0		SAND, tan to gray, silty, with rock (fill) (SP)	25	1		SPT Sampler	10	7
+9.9	2.0						+9.9	2	
+8.9	3.0		SILT, black to dark brown, sandy, soft (w=18%, LL=24%, PI=9%) (ML)	100	2		SPT Sampler	1	3
			CLAY, dark gray to gray, silty, soft (w=12%, LL=20%, PI=9%) (CL)	100	3		SPT Sampler	2	8
+5.9	6.0		Tan to brown, sandy, trace rock				+5.9	8	
+5.4	6.5		SAND, medium, dark brown, trace limestone (SP)	100	4		SPT Sampler	4	12
			LIMESTONE, white to light gray, clayey, weathered (LS)				+3.9	26	
			Light gray, trace shell	100	5		SPT Sampler	10	>50
							+2.9	50	
-1.1	13.0								
-2.1	14.0		CLAY, tan, silty, trace limestone, stiff (CL)	100	6		SPT Sampler	1	11
			LIMESTONE, tan, clayey, trace shell (LS)				-3.1	10	
-6.6	18.5								
			CLAY, bluish green, calcareous, medium stiff (w=27%, LL=34%, PI=13%) (CL)	100	7		SPT Sampler	1	5
							-8.1	3	
-11.6	23.5								
			SILT, dark green to gray, clayey, trace shell, stiff (ML)	89	8		SPT Sampler	6	12
			Gray, calcareous				-13.1	6	
-16.6	28.5								
			LIMESTONE, gray, sandy, with shell, weathered (LS)	89	9		SPT Sampler	6	24
-18.1	30.0						-18.1	12	
			BORING TERMINATED AT 30 FEET ON 11/20/2004						

URS JOB NUV  
 ARMY CORP LOGS  
 38615215  
 11/3/03 SFWMD STA5N-CB-0017 1/20/05

DRILLING LOG		DIVISION	INSTALLATION	SHEET OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=686813.31(E),Y=757819.16(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0018			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 6.9 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/23/2004 : 11/23/2004	
8. DEPTH DRILLED INTO ROCK 12.0 Ft.			17. ELEVATION TOP OF BORING +13.4 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT	N- VALUE
+13.4	0.0		SAND, fine, tan to light gray, silty, with limestone fragments (roadway fill) (SP)	50	1		SPT Sampler	12	14
			(-200=54.7%, w=18%) (SC)	25	2		+11.4 SPT Sampler	8	7
+9.4	4.0		Gray to brown, clayey, trace rock					6	
+8.7	4.7		Dark brown, silty, organic				+9.4 SPT Sampler	5	
+8.0	5.5		PEAT, dark brown, silty, medium stiff (PT)	71	3			4	3
+6.9	6.5		CLAYEY SAND, gray, trace limestone (SC)				+7.4 SPT Sampler	3	
			PEAT, dark brown, silty, organics, soft(PT)	50	4			2	7
			CLAY, gray to light brown, trace weathered limestone, stiff (CL)				+5.4 SPT Sampler	4	
+4.9	8.5		LIMESTONE, gray, clayey, with shell (LS)	8	5		+4.8 SPT Sampler	3	
								7	>50
-0.1	13.5		CLAYEY SAND, medium to fine, light gray, calcareous, and shell (-200=28.7%, w=27%) (SC)	67	6		SPT Sampler	11	2
							-1.6	1	
			Fine, bluish green to gray, silty	89	7		SPT Sampler	1	6
							-6.6	2	
-9.6	23.0		LIMESTONE, gray, sandy, with shell, weathered (LS)	83	8		SPT Sampler	4	22
							-11.6	6	
								12	
-16.6	30.0			67	9		SPT Sampler	10	19
							-16.6	10	
								9	
			BORING TERMINATED AT 30 FEET ON 11/23/2004						

<b>DRILLING LOG</b>		DIVISION		INSTALLATION		SHEET 1 OF 1 SHEET	
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN				10. SIZE AND TYPE OF BIT See remarks			
2. LOCATION COORDINATES FLORIDA X=686734.99(E),Y=758592.19(N)				11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29			
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES				12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53			
4. BORING DESIGNATION CP05-STA5N-CB-0019				13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0			
5. NAME OF DRILLER JOHN				14. TOTAL NUMBER CORE BOXES 0			
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER 8.1 Ft.			
7. THICKNESS OF OVERBURDEN N/A Ft.				16. DATE BORING : STARTED : COMPLETED : 11/22/2004 : 11/22/2004			
8. DEPTH DRILLED INTO ROCK 3.5 Ft.				17. ELEVATION TOP OF BORING +11.6 Ft.			
9. TOTAL DEPTH OF HOLE 30.0 Ft.				18. TOTAL CORE RECOVERY FOR BORING N/A %			
				19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+12.7	0.0		SAND, tan, with limestone fragments, gravel (roadway fill) (SP)	25	1		SPT Sampler	8	6	0.0
+10.7	2.0						+10.7 SPT Sampler	2		
+8.7	4.0		CLAYEY SAND, tan to yellow, silty, with weathered limestone, trace shell (-200=18.1%, w=23%) (SC)	58	2		+8.7 SPT Sampler	2	5	2.5
+6.7	6.0		LIMESTONE AND CLAYEY SAND, tan to yellow, weathered (LS-SC)	50	3		+6.7 SPT Sampler	3	6	5.0
+4.7	8.0		LIMESTONE, tan, clayey, weathered, with shell (LS)	100	4		+4.7 SPT Sampler	3	7	7.5
			CLAY, tan, with weathered limestone, soft (LS-CL)	13	5		+2.7 SPT Sampler	1	1	10.0
-0.8	13.5									12.5
			CLAY, white, with weathered limestone, very stiff (CL-LS)	100	6		-2.3 SPT Sampler	10	21	15.0
-5.8	18.5									17.5
			SANDY CLAY, bluish gray, calcareous, abundant shell, medium stiff (SC)	89	7		-7.3 SPT Sampler	1	6	20.0
-10.8	23.5									22.5
			SILT, bluish gray, clayey, calcareous, trace sand, very stiff (ML)	67	8		-12.3 SPT Sampler	10	17	25.0
-15.8	28.5									27.5
-17.3	30.0		LIMESTONE, gray to light gray, slightly clayey, weathered (LS)	83	9		-17.3 SPT Sampler	7	17	30.0
			BORING TERMINATED AT 30 FEET ON 11/22/2004							

DRILLING LOG		DIVISION		INSTALLATION		SHEET 1 OF 1 SHEET			
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN				10. SIZE AND TYPE OF BIT See remarks					
2. LOCATION COORDINATES FLORIDA X=686729.83(E),Y=759508.37(N)				11. COORDINATE SYSTEM/DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29					
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES				12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53					
4. BORING DESIGNATION CP05-STA5N-CB-0020				13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0					
5. NAME OF DRILLER JOHN				14. TOTAL NUMBER CORE BOXES 0					
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER 7.1 Ft.					
7. THICKNESS OF OVERBURDEN N/A Ft.				16. DATE BORING STARTED : 11/22/2004 COMPLETED : 11/22/2004					
8. DEPTH DRILLED INTO ROCK 5.0 Ft.				17. ELEVATION TOP OF BORING +11.6 Ft.					
9. TOTAL DEPTH OF HOLE 30.0 Ft.				18. TOTAL CORE RECOVERY FOR BORING N/A %					
				19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist					
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+11.6	0.0		SAND, tan to yellow, clayey, with rock fragments, fill	29	1		SPT Sampler	12	7
							+9.6	4	
			Black to dark brown, silty (-200=11.7%, w=48%) (SP-SC)	25	2		SPT Sampler	1	3
							+7.6	2	
+7.6	4.0		SANDY CLAY, dark brown to brown, trace rock, soft (CL)	88	3		SPT Sampler	2	3
							+5.6	2	
+5.6	6.0		Tan, silty						
			SILTY SAND, dark brown to black, trace rock	75	4		SPT Sampler	2	6
							+3.6	3	
+3.6	8.0		Brown, clayey (w=18%) (SM)						
			Tan, and weathered limestone	83	5		SPT Sampler	2	2
							+1.6	1	
			CLAYEY SAND, tan to gray, calcareous, abundant shell (SC)						
-1.9	13.5								
			CLAY, white to light gray, slightly sandy, calcareous (w=24%, LL=29%, PI=9%) (CL)	100	6		SPT Sampler	WOH	
							-3.4	3	
-6.9	18.5								
			LIMESTONE, tan, clayey, weathered (LS)	67	7		SPT Sampler	3	8
							-8.4	5	
-11.9	23.5								
			CLAYEY SAND, dark gray, calcareous (SC)	83	8		SPT Sampler	3	10
							-13.4	4	
-18.4	30.0			100	9		SPT Sampler	4	9
							-18.4	5	
			BORING TERMINATED AT 30 FEET ON 11/22/2004						

38615215  
11/3/03 SFWMD STA5&6.GPJ ACE 1836.GDT 1/20/05  
URS JOB NUM  
ARMY CORP LOGS

DRILLING LOG		DIVISION	INSTALLATION	SHEET OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=686718.77(E),Y=760446.29(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STASN-CB-0021			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 8.3 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/22/2004 : 11/22/2004	
8. DEPTH DRILLED INTO ROCK 8.5 Ft.			17. ELEVATION TOP OF BORING +12.8 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT	N- VALUE
+12.8	0.0		SILTY SAND, light gray to tan, trace rock (SC-SM)	58	1		SPT Sampler	8	8
+10.8	2.0		Gray to tan, clayey				+10.8	6	
+10.6	2.2		LIMESTONE, orange to brown, with sand, weathered (-200=2.4%, w=24%) (SP)	67	2		SPT Sampler	2	7
			SILTY SAND, dark brown to brown				+8.8	2	
+7.8	5.0		Organic, trace rock (-200=11.5%, w=19%) Tan to yellow, clayey, with weathered limestone (SP-SM)	8	3		SPT Sampler	3	>50
			LIMESTONE, tan, slightly clayey, weathered (LS)				+8.0	50	
			Dark gray to brown, clayey	75	4		SPT Sampler	15	27
			White to light gray, calcareous				+4.8	20	
				75	5		SPT Sampler	7	8
							+2.8	3	
								5	
-0.7	13.5		CLAY, white, trace weathered limestone, very soft (w=32%, LL=27%, PI=10%) (CL)	100	6		SPT Sampler	2	2
							-2.2	1	
-5.7	18.5		SAND, gray to bluish gray, calcareous (SP)	78	7		SPT Sampler	2	8
							-7.2	3	
			Bluish gray, clayey, and shell, with limestone, abundant shell	100	8		SPT Sampler	4	7
							-12.2	3	
-15.7	28.5		SILTY SAND, bluish gray, clayey, silty, (SM) calcareous	100	9		SPT Sampler	4	6
-17.2	30.0						-17.2	3	
			BORING TERMINATED AT 30 FEET ON 11/22/2004						

DRILLING LOG		DIVISION		INSTALLATION		SHEET 1 OF 1 SHEET	
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN				10. SIZE AND TYPE OF BIT See remarks			
2. LOCATION COORDINATES FLORIDA X=686704.77(E), Y=761350.88(N)				11. COORDINATE SYSTEM \ DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29			
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES				12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53			
4. BORING DESIGNATION CP05-STA5N-CB-0022				13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0			
5. NAME OF DRILLER JOHN				14. TOTAL NUMBER CORE BOXES 0			
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER 6.6 Ft.			
7. THICKNESS OF OVERBURDEN N/A Ft.				16. DATE BORING STARTED : 11/22/2004 COMPLETED : 11/22/2004			
8. DEPTH DRILLED INTO ROCK 7.5 Ft.				17. ELEVATION TOP OF BORING +11.6 Ft.			
9. TOTAL DEPTH OF HOLE 30.0 Ft.				18. TOTAL CORE RECOVERY FOR BORING N/A %			
				19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+11.6	0.0		SAND, dark brown to tan, silty, with rock	75	1		SPT Sampler	2	6
			Dark brown (-200=4.4%, w=21%) (SP)	75	2		SPT Sampler	2	
+7.6	4.0		Gray, clayey					2	4
								2	
			LIMESTONE AND SAND, tan to yellow, (LS-SP) clayey, weathered	67	3		SPT Sampler	3	6
+5.6	6.0						SPT Sampler	3	
			LIMESTONE, light gray, sandy, clayey, with shell, calcareous (LS)	67	4		SPT Sampler	2	5
			With sand matrix					3	
								2	
								2	
								2	6
								3	
								3	
-1.9	13.5		CLAY, white, with weathered limestone (w=23%, LL=23%, PI=7%) (CL-LS)	100	6		SPT Sampler	4	12
								6	
								6	8
-6.9	18.5		CLAYEY SAND, medium, light gray, with abundant shell, trace weathered limestone (SC)	67	7		SPT Sampler	4	
								4	28
-11.9	23.5		SAND, fine, gray, slightly clayey, with shell, calcareous (SP)	83	8		SPT Sampler	8	
								13	9
			Blue gray	100	9		SPT Sampler	3	
-18.4	30.0		BORING TERMINATED AT 30 FEET ON 11/22/2004					6	

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=686688.86(E),Y=762258.96(N)			11. COORDINATE SYSTEM\DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0023			13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 7.8 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING STARTED : 11/20/2004 COMPLETED : 11/20/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +11.8 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+11.8	0.0		PEAT, dark brown, silty, soft (PT)	42	1		SPT Sampler	3	8
+9.5	2.3		CLAYEY SAND, dark brown to brown to tan	83	2		SPT Sampler	2	6
			Brown to dark brown, with silt (-200=21.8%, w=24%) Tan to light gray (SC)	75	3		SPT Sampler	2	13
			Yellow to tan, with limestone fragments					3	
+5.3	6.5		Brown to tan	100	4		SPT Sampler	5	40
			Yellow to brown (-200=26.1%, w=17%) (SC)					10	
+3.8	8.0		CLAY, white, silty, hard (CL)					30	
+2.8	9.0		CLAYEY SAND, gray to dark gray, with rock (w=24%, LL=24%, PI=6%) (SC)	83	5		SPT Sampler	6	24
			CLAY, gray to tan, silty, hard					18	
								22	
				100	6		SPT Sampler	1	1
			Light gray, with rock fragments, very soft (w=36%, LL=25%, PI=4%) (CL)					0	
								1	
-6.7	18.5		CLAYEY SAND, fine, bluish green, calcareous, with limestone fragments and shell (SC)	89	7		SPT Sampler	3	11
								4	
								7	
-11.7	23.5		CLAY, blue gray, silty, calcareous with shell and rock fragments, medium stiff (CL)	100	8		SPT Sampler	4	7
								4	
								3	
-16.7	28.5		SAND, medium, bluish gray, silty, trace shell (SP)	100	9		SPT Sampler	5	12
								6	
								6	
-18.2	30.0		BORING TERMINATED AT 30 FEET ON 11/20/2004						

URS JOB NUM 38615215  
 ARMY CORP LOGS  
 11/23/03 SFWM STA5N-CB-0023  
 ACE 1836.GDT 1/20/05

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=688029.61(E),Y=757822.80(N)			11. COORDINATE SYSTEM\DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0024			13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0	
5. NAME OF DRILLER DAVE & MARK			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 8.9 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING STARTED : 11/23/2004 COMPLETED : 11/23/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +12.9 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR Beau	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+12.9	0.0		LIMESTONE AND SAND, gray to dark brown, and organics (fill)	75	1		SPT Sampler	8	22
+10.9	2.0		SAND, brown to dark brown, trace silt, and organics (SP)	58	2		SPT Sampler	2	5
			With limestone fragments	63	3		SPT Sampler	7	11
+6.9	6.0		CLAYEY SAND, medium, light brown. with crushed limestone (-200=53.8%, w=18%) (SC)	75	4		SPT Sampler	4	21
			(-200=53.8%, w=18%) (CL-SC)	75	5		SPT Sampler	4	28
			Light brown to green, with shell	78	6		SPT Sampler	7	10
-5.6	18.5		SAND, fine, greenish gray, trace clay, and shell (SP)	67	7		SPT Sampler	6	18
			Gray, trace limestone fragments	100	8		SPT Sampler	5	26
-15.6	28.5		CLAYEY SAND, fine, greenish, trace shell (SC)	83	9		SPT Sampler	5	14
-17.1	30.0		BORING TERMINATED AT 30 FEET ON 11/23/2004						

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT	N- VALUE		
+12.7	0.0		SAND, tan, silty, with rock fragments (SP) (roadway fill)	33	1		SPT Sampler	11	13		
+10.7	2.0				+10.7	9					
	6.0		LIMESTONE AND CLAYEY SAND, dark brown, silty, organic (-200=12.7%, w=14%) Brown (SP-SC-LS) Light brown to orange, clayey, with weathered limestone (w=15%, LL=26%, PI=6%) Tan to yellow, silty, trace shell	50	2		SPT Sampler	2	7		
					+8.7	3		3			
						63	3		SPT Sampler	1	5
							+6.7	17		3	
-5.8	18.5		LIMESTONE, tan, clayey, sandy, weathered (LS)	101	4		+6.3 SPT Sampler	50	>50		
				88	5		SPT Sampler	2	8		
					+2.7	7		5			
						100	6		SPT Sampler	8	5
			-2.3	2		3					
-10.8	23.5		CLAYEY SAND, fine, bluish gray, slightly (SC) clayey, with shell	89	7		SPT Sampler	4	8		
					-7.3	5		3			
-15.8	28.5		LIMESTONE AND SAND, medium to fine, tan to light gray, slightly clayey, silty, weathered, (LS-SP)	100	8		SPT Sampler	6	11		
					-12.3	6		5			
-17.3	30.0		SILTY SAND, fine, dark gray, slightly clayey, odor (SM)	100	9		SPT Sampler	4	17		
					-17.3	10		7			
			BORING TERMINATED AT 30 FEET ON 11/23/2004								

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT	N- VALUE
+12.5	0.0		SILT, light brown to gray, with limestone fragments (fill), very stiff (-200=30.7%, w=9%, LL=25%, PI=5%) (ML)	33	1		SPT Sampler	11	20
+10.5	2.0						+10.5	14	
			SAND, fine, gray and brown, trace silt, and organics	58	2		SPT Sampler	5	8
							+8.5	4	
			Light brown, clayey, trace limestone fragments (-200=18.8%, w=14%) (SC)	75	3		SPT Sampler	9	11
+6.5	6.0						+6.5	6	
			LIMESTONE AND SAND, fine, light brown, clayey, weathered (LS-SP)	67	4		SPT Sampler	8	60
							+4.5	28	
				67	5		SPT Sampler	32	27
							+2.5	15	
								7	
								16	
								11	
								9	
-1.0	13.5								
			SAND, fine, light brown, trace shell (SP)	44	6		SPT Sampler	6	11
							-2.5	6	
								5	
-6.0	18.5								
			CLAYEY SAND, fine, greenish, trace shell, and limestone fragments (SC)	89	7		SPT Sampler	2	6
							-7.5	2	
								4	
				100	8		SPT Sampler	5	5
							-12.5	3	
								2	
-16.0	28.5								
			SAND, fine, greenish gray, trace shell, and clay (SP)	100	9		SPT Sampler	6	19
-17.5	30.0						-17.5	9	
			BORING TERMINATED AT 30 FEET ON 11/23/2004					10	

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>	SHEET OF 1 SHEET
1. PROJECT <b>SFWM D STA 5/6 EXPANSION DESIGN</b>		10. SIZE AND TYPE OF BIT      See remarks		
2. LOCATION COORDINATES <b>FLORIDA X=691018.67(E),Y=757808.29(N)</b>		11. COORDINATE SYSTEM \ DATUM      DISTURBED      UNDISTURBED : NAD83      : NGVD29		
3. DRILLING AGENCY <b>WILLIAMS EARTH SCIENCES</b>		12. MANUFACTURER'S DESIGNATION OF DRILL <b>Mobile B53</b>		
4. BORING DESIGNATION <b>CP05-STA5N-CB-0027</b>		13. TOTAL SAMPLES      DISTURBED      UNDISTURBED : 9      : 0		
5. NAME OF DRILLER <b>JOHN</b>		14. TOTAL NUMBER CORE BOXES      0		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED      _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER      8 Ft.		
7. THICKNESS OF OVERBURDEN      N/A Ft.		16. DATE BORING      STARTED      COMPLETED : 11/23/2004      : 11/23/2004		
8. DEPTH DRILLED INTO ROCK      19.5 Ft.		17. ELEVATION TOP OF BORING      +12.5 Ft.		
9. TOTAL DEPTH OF HOLE      30.0 Ft.		18. TOTAL CORE RECOVERY FOR BORING      N/A %		
		19. SIGNATURE AND TITLE OF INSPECTOR <b>J. Langley, Geologist</b>		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RCD OR UD	REMARKS	BLOWS/ 0.5 FT	N- VALUE
+12.5	0.0		SAND, tan to yellow, silty, with rock (roadway fill) (SP)	33	1		SPT Sampler	23 18 3	21
			With limestone	50	2		SPT Sampler	13 9 4	11
+8.5	4.0		LIMESTONE, tan to yellow, slightly clayey, silty, weathered (LS)	50	3		SPT Sampler	3 4 2	6
			Clayey	50	4		SPT Sampler	2 8 11	19
				50	5		SPT Sampler	12 50	>50
			Tan, slightly clayey, trace shell	83	6		SPT Sampler	2 20 15	35
				78	7		SPT Sampler	7 5 6	11
-11.0	23.5		SILTY SAND, fine, gray to dark gray, clayey, with shell (SM)	83	8		SPT Sampler	3 3 6	9
-16.0	28.5		SILT, fine, dark gray, sandy, clayey, trace shell, medium stiff (ML)	100	9		SPT Sampler	2 3 5	8
-17.5	30.0								
			BORING TERMINATED AT 30 FEET ON 11/23/2004						

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RCD OR UD	REMARKS	BLOWS/ 0.5 FT	N- VALUE	
+11.7	0.0		SAND, fine, gray, trace shell, and roots (SP)	8	1		SPT Sampler	11 6 4 4	10	
				Dark brown, trace organics	50	2		SPT Sampler	4 5 9	14
+8.2	3.5			LIMESTONE AND SAND, fine, light brown, clayey, caprock, weathered (LS-SP)	58	3		SPT Sampler	15 9 13 27	22
					50	4		SPT Sampler	4 35 50	85
					0	5		SPT Sampler	50	>50
+2.2	9.5									
				SAND, fine, gray, trace shell, trace clay (SP)				+1.7		
				Light brown, trace sand, and shell	67	6		SPT Sampler	7 11 9	20
								-3.3		
			(-200=13.9%, w=22%) (SC)	100	7		SPT Sampler	6 8 5	13	
							-8.3			
-11.8	23.5		CLAYEY SAND, fine, greenish, trace shell (SC)	100	8		SPT Sampler	2 1 1	2	
							-13.3			
-18.3	30.0			100	9		SPT Sampler	2 4 5	9	
							-18.3			
			BORING TERMINATED AT 30 FEET ON 11/23/2004							

URS JOB NUM 38615215  
ARMY\_CORP\_LOGS 11/3/03 SFWMD ST5&6.GPJ ACE\_1836.GDT 1/25/05

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=693001.23(E), Y=757810.04(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0029			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 7.8 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/30/2004 : 11/30/2004	
8. DEPTH DRILLED INTO ROCK 18.5 Ft.			17. ELEVATION TOP OF BORING +11.8 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+11.8	0.0		LIMESTONE, tan, clayey, weathered, with shell (LS)	25	1		SPT Sampler	9	18	0.0
			Brown to yellow	25	2		SPT Sampler	4	11	2.5
			Brown to yellow, sandy	50	3		SPT Sampler	6	18	5.0
			Brown to tan	100	4		SPT Sampler	8	>50	7.5
+3.3	8.5			Tan (w=16%, LL=19%, PI=3%) CLAY, light gray, with weathered limestone, stiff (CL-LS)	50	5		SPT Sampler	14	19
								5		12.5
-1.7	13.5		LIMESTONE, light gray, silty, sandy, weathered (LS)	78	6		SPT Sampler	6	22	15.0
								4		17.5
			Slightly clayey, with shell	67	7		SPT Sampler	8	14	20.0
								6		22.5
-11.7	23.5		LIMESTONE AND CLAYEY SAND, medium to fine, gray, with shell, weathered (LS-SC)	100	8		SPT Sampler	5	29	25.0
								9		27.5
-16.7	28.5		SAND, dark gray, silty (SP)	56	9		SPT Sampler	11	34	30.0
-18.2	30.0			BORING TERMINATED AT 30 FEET ON 11/30/2004					17	

DRILLING LOG		DIVISION	INSTALLATION	SHEET OF 1 SHEETS
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694713.87(E), Y=757803.94(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0030			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 9.1 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 11/24/2004 : 11/24/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +12.6 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+12.6	0.0		SAND, fine, light brown, limerock, trace root (SP)	58	1		SPT Sampler	20	37
							+10.6	21	
								16	
			Silty, trace shell, trace dark brown sand, trace organics	25	2		SPT Sampler	3	16
							+8.6	7	
								4	
			LIMESTONE AND SAND, fine, light brown, with limestone fragments, trace shell (LS-SP)	67	3		SPT Sampler	7	30
							+6.6	11	
								19	
			Light gray, trace clayey sand, and shell (-200=25.5%, w=16%) (SC)	54	4		SPT Sampler	4	9
							+4.6	2	
								7	
				67	5		SPT Sampler	12	62
							+2.6	5	
								12	
			Clayey					50	
			(-200=24%, w=15%)	67	6		SPT Sampler	5	20
							-2.4	9	
								11	
			Trace shell	78	7		SPT Sampler	6	24
							-7.4	13	
								11	
			SAND, gray to light gray, with shell, trace rock (SP)	67	8		SPT Sampler	17	35
							-12.4	16	
								19	
			Gray, trace cemented sand	89	9		SPT Sampler	14	33
							-17.4	17	
								16	
			BORING TERMINATED AT 30 FEET ON 11/24/2004						

<b>URS</b> LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694816.10(E),Y=757798.24(N)			11. COORDINATE SYSTEM\DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0031			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 11.1ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/6/2004 : 12/6/2004	
8. DEPTH DRILLED INTO ROCK 24.0 Ft.			17. ELEVATION TOP OF BORING +15.1 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE	
+15.1	0.0		SAND, fine, tan, with limerock (fill) (SP)	17	1		SPT Sampler	40		0.0
+13.1	2.0							34	51	
								17		
			LIMESTONE AND PEAT, tan yellow, (LS-PT)	33	2		SPT Sampler	5		2.5
			weathered, caprock					3		
			Dark brown, silty					6	13	
			(OC=7%)					7		
				17	3		SPT Sampler	2		5.0
								1		
								1	2	
+9.1	6.0		LIMESTONE, tan, clayey, and silt, and shell,	33	4		SPT Sampler	12		7.5
			weathered (LS)					9	18	
			Yellow tan					9		
			Tan yellow, with sandy clay, calcareous	33	5		SPT Sampler	7		
								3	16	10.0
								8		
								8		
								5		
										12.5
			Tan, sandy	78	6		SPT Sampler	9		
								24	36	15.0
								12		
										17.5
				78	7		SPT Sampler	6		
								19	55	20.0
								36		
										22.5
				89	8		SPT Sampler	7		
								9	18	25.0
								9		
										27.5
				47	9		SPT Sampler	6		
								34	84	30.0
								50		
-14.9	30.0		BORING TERMINATED AT 30 FEET ON							
			12/6/2004							
			URS Corporation							
			7800 Congress Avenue, Suite 200							
			Boca Raton, FL 33487							
			Tel: 561.994.6500							
			Fax: 561.994.6524							

(Continued)

DRILLING LOG		DIVISION	INSTALLATION	SHEET OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694776.41(E),Y=759461.65(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0032			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 9 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 10.4ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/3/2004 : 12/3/2004	
8. DEPTH DRILLED INTO ROCK 5.0 Ft.			17. ELEVATION TOP OF BORING +14.4 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N VALUE
+14.4	0.0		SAND, fine, light brown, trace silt, and limestone (fill) (SP)	50	1		SPT Sampler	22	
							+12.4	24	34
				8	2		SPT Sampler	10	
								11	
+10.4	4.0							3	3
								2	
								1	
							+10.4	1	
				17	3		SPT Sampler	1	
								1	
+8.4	6.0		LIMESTONE AND SAND, fine, light brown, silty (LS-SP)					1	2
							+8.4	1	
								9	
			SAND, fine, light brown, clayey, with limestone fragments (-200=29.7%, w=27%) (SC)	100	4		SPT Sampler	8	
								8	
							+6.4	11	19
								30	
				33	5		SPT Sampler	15	
								7	19
							+4.4	12	
								13	
+0.9	13.5								
			CLAY, light gray, weathered, trace limestone (-200=52.2%, w=17%, LL=25%, PI=7%) (CL)	83	6		SPT Sampler	14	
								18	
							-0.6	20	38
-4.1	18.5								
			LIMESTONE, light gray (LS)	67	7		SPT Sampler	14	
								19	
							-5.6	16	35
-9.1	23.5								
			SAND AND SHELL, fine, light gray, some crushed sand, trace limestone (SP)	44	8		SPT Sampler	9	
								8	
							-10.6	6	14
-14.1	28.5								
			SANDY CLAY, grayish green, sandy clay, trace shell (SP)	78	9		SPT Sampler	4	
								4	
-15.6	30.0							5	9
			BORING TERMINATED AT 30 FEET ON 12/3/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694700.74(E), Y=760410.74(N)			11. COORDINATE SYSTEM/DATUM DISTURBED : NAD83 UNDISTURBED : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0033			13. TOTAL SAMPLES DISTURBED : 9 UNDISTURBED : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 7.8 Ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING STARTED : 12/3/2004 COMPLETED : 12/3/2004	
8. DEPTH DRILLED INTO ROCK N/A Ft.			17. ELEVATION TOP OF BORING +10.8 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+10.8	0.0		SAND, fine, dark brown, trace silt, and organics (SP)	50	1		SPT Sampler	3	5
			Silty, with limestone fragments	50	2		+8.8 SPT Sampler	2	6
			Light brown	63	3		+6.8 SPT Sampler	10	16
				21	4		+4.8 SPT Sampler	50	>50
			Light gray, clayey (-200=28.4%, w=12%) (SC)	25	5		+2.8 SPT Sampler	2	66
							+0.8	16	
								50	
								50	
			(-200=29.9%, w=17%) (SC)	67	6		-4.2 SPT Sampler	4	11
								5	
								6	
				67	7		-9.2 SPT Sampler	6	36
								14	
								22	
				56	8		-14.2 SPT Sampler	10	20
								12	
								8	
			Trace limestone fragments	67	9		-19.2 SPT Sampler	4	11
								5	
								6	
-19.2	30.0		BORING TERMINATED AT 30 FEET ON 12/3/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT SFWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694735.38(E),Y=761268.05(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED NAD83 NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0034			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED 9 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 10.5ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED 12/3/2004 12/3/2004	
8. DEPTH DRILLED INTO ROCK 7.0 Ft.			17. ELEVATION TOP OF BORING +14.5 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+14.5	0.0		LIMESTONE, tan ( fill)	50	1		SPT Sampler	29	27
+12.5	2.0		PEAT, dark brown, medium stiff (w=227%, OC=53%) (PT)	50	2		SPT Sampler	7	4
			(w=202%, OC=34%) (PT)	63	3		SPT Sampler	2	5
+8.5	6.0		LIMESTONE AND SILTY SAND, grayish brown (w=21%, LL=23%, PI=5%) (LS-SM)	63	4		SPT Sampler	6	12
				67	5		SPT Sampler	12	23
								14	
								23	
+1.0	13.5		LIMESTONE AND CLAYEY SAND, grayish (LS-SC)	83	6		SPT Sampler	8	14
								5	
								9	
			With clay	83	7		SPT Sampler	7	12
								7	
								5	
-9.0	23.5		LIMESTONE, brown, trace cemented clay (LS)	6	8		SPT Sampler	5	14
								6	
								8	
-14.0	28.5		SAND, sand, light gray, with shell, and marl (SP)	100	9		SPT Sampler	5	10
								5	
								5	
-15.5	30.0		BORING TERMINATED AT 30 FEET ON 12/3/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEET
1. PROJECT FWMD STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694702.76(E), Y=762667.61(N)			11. COORDINATE SYSTEM/DATUM : DISTURBED : UNDISTURBED NAD83 NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0035			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED 9 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 11.5ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED 11/30/2004 11/30/2004	
8. DEPTH DRILLED INTO ROCK 8.0 Ft.			17. ELEVATION TOP OF BORING +14.5 Ft.	
9. TOTAL DEPTH OF HOLE 30.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+14.5	0.0		SAND, light gray, silty, with caprock, and limerock (levee fill) (SP)	50	1		SPT Sampler	10 14 14	28
+12.5	2.0						+12.5	12	
+11.5	3.0		CLAYEY SAND, light brown, with limerock (SC)	33	2		SPT Sampler	6 8 DNF	
			LIMESTONE, gray to brown, silty, weathered, with shell (LS)	25	3		SPT Sampler	1 2 2	4
+8.5	6.0						+8.5	3	
			PEAT, dark brown to black, fibrous, high organics, medium stiff (w=459%, OC=79%) (PT)	75	4		SPT Sampler	2 2 3	5
			And silty clay, very organic, soft (w=68%, OC=9%)	50	5		SPT Sampler	2 2 1	3
							+4.5	3	
+2.5	12.0								
			LIMESTONE AND CLAY, tan to light gray clay, with weathered limestone, and shell (w=22%, LL=26%, PI=10%) (LS-CL)	67	6		SPT Sampler	4 3 1	4
							-0.5		
-4.0	18.5								
			LIMESTONE, tan to light gray, clayey, weathered, with shell (LS)	100	7		SPT Sampler	5 4 3	7
							-5.5		
-9.0	23.5								
			CLAY, gray to greenish gray, silty, with shell, soft (w=21%, LL=27%, PI=7%) (CL)	67	8		SPT Sampler	4 2 2	4
							-10.5		
-14.0	28.5								
			SAND, medium, tan to light gray (SP)	56	9		SPT Sampler	14 19 15	34
-15.5	30.0						-15.5		
			BORING TERMINATED AT 30 FEET ON 11/30/2004						

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 3 SHEETS
1. PROJECT SFWM STA 5/6 EXPANSION DESIGN			10. SIZE AND TYPE OF BIT See remarks	
2. LOCATION COORDINATES FLORIDA X=694707.92(E), Y=763060.81(N)			11. COORDINATE SYSTEM \ DATUM : DISTURBED : UNDISTURBED : NAD83 : NGVD29	
3. DRILLING AGENCY WILLIAMS EARTH SCIENCES			12. MANUFACTURER'S DESIGNATION OF DRILL Mobile B53	
4. BORING DESIGNATION CP05-STA5N-CB-0036			13. TOTAL SAMPLES : DISTURBED : UNDISTURBED : 18 : 0	
5. NAME OF DRILLER JOHN			14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER 12.5ft.	
7. THICKNESS OF OVERBURDEN N/A Ft.			16. DATE BORING : STARTED : COMPLETED : 12/9/2004 : 12/9/2004	
8. DEPTH DRILLED INTO ROCK 36.5 Ft.			17. ELEVATION TOP OF BORING +15.5 Ft.	
9. TOTAL DEPTH OF HOLE 75.0 Ft.			18. TOTAL CORE RECOVERY FOR BORING N/A %	
			19. SIGNATURE AND TITLE OF INSPECTOR J. Langley, Geologist	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N- VALUE
+15.5	0.0		SAND, fine, brown to tan, silty, slightly clayey, with weathered limestone fragments (SP)	75	1		SPT Sampler	12 17 12	29
+13.5	2.0		SANDY CLAY, brown, silty, trace shell, with weathered limestone fragments (CL)	33	2		SPT Sampler	3 3 2	5
+11.5	4.0		PEAT, dark brown, silty, with shell and wood pieces, very soft (w=32%, OC=6%) (PT)	50	3		SPT Sampler	1 0 2	2
+8.5	7.0		LIMESTONE, light gray, caprock, weathered (LS)	33	4		SPT Sampler	1 2	>50
				3	5		SPT Sampler	50/5"	
								50/3"	
			And clayey sand	50	6		SPT Sampler	3 2 5	7
			(w=25%, LL=29%, PI=3%)	100	7		SPT Sampler	2 3 5	8
			(-200=12.5%, w=18%)	67	8		SPT Sampler	5 8 6	14
			With shell	83	9		SPT Sampler	2 1	3
-13.0	28.5		SILTY SAND, fine, gray, slightly clayey (SM)						

(Continued)

SHEET 2  
OF 3 SHEETS

VERTICAL

NGVD29

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% REC	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT-	N- VALUE
-28.0	43.5		SILTY SAND, fine, gray, slightly clayey (continued)  Some cemented sand	83	10		SPT Sampler -19.5	2 4 3	7
-33.0	48.5		SAND, medium to coarse, gray, with shell, slight sulfur-like smell (SP)	67	12		SPT Sampler -29.5	8 10 10	20
-38.0	53.5		LIMESTONE AND SAND, medium to coarse, gray, weathered limestone, and shell, slight sulfur-like smell (LS-SP)	67	13		SPT Sampler -34.5	9 12 14	26
-53.0	68.5		LIMESTONE, gray, sandy weathered, calcareous, with shell, sulfur-like smell (LS)	83	14		SPT Sampler -39.5	23 14 16	30
				67	15		SPT Sampler -44.5	15 21 22	43
				67	16		SPT Sampler -49.5	12 11 12	23

(Continued)

(Continued)



## **APPENDIX B**

### **FIELD PERMEABILITY DATA**

# SFWMD

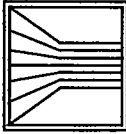
## STA 5 EXPANSION PROJECT

### In- situ Constant Head Permeability Tests

	C1-1	C1-2	C1-3	C2-1	C2-2	C2-3
Test interval	35-45	20-30	5-15	5-15	35-45	20-30
Q=	0.00011	0.00006	0.00056	0.00009	0.00006	0.00007
r=	0.29	0.29	0.29	0.29	0.29	0.29
l=	10	10	10	10	10	10
H=	3.5	3	3	0.8	1.5	1.5
l/r=	34.28571429	34.28571429	34.28571429	34.28571429	34.28571429	34.28571429
Cs=	60	60	60	60	60	60
k=	1.7E-06	1.1E-06	1.0E-05	6.0E-06	2.1E-06	2.5E-06
Subsoil within testing section	Sand, silty, clayey	Lstone	Lstone clay sand	Lstone sandy clay lstone sand	silty and clayey sand Lstone fragments	silty and clayey sand Lstone fragments

## **APPENDIX C**

### **LABAROTARY DATA**



WILLIAMS EARTH SCIENCES, INC  
1900 N.W. 40 th Ct.  
Pompano Beach, FL. 33064-8718  
954-972-7570 Fax: 954-972-6608

## MOISTURE - DENSITY RELATIONSHIP

**Project Name:** STA 5-WORK AREA C  
**Client:** URS  
**Project Number:** F304034  
**Contract Number:**  
**Proctor Number:** S-3 43+50

### Sample Identification:

**Description:** D.Brown fine sand with some limerock  
**Location:**  
**Date Sampled:** 01/26/05  
**Source:** EXCV.  
**Material No. :**  
**Passing #4:** 79.9%  
**Compaction Method:** Mechanical

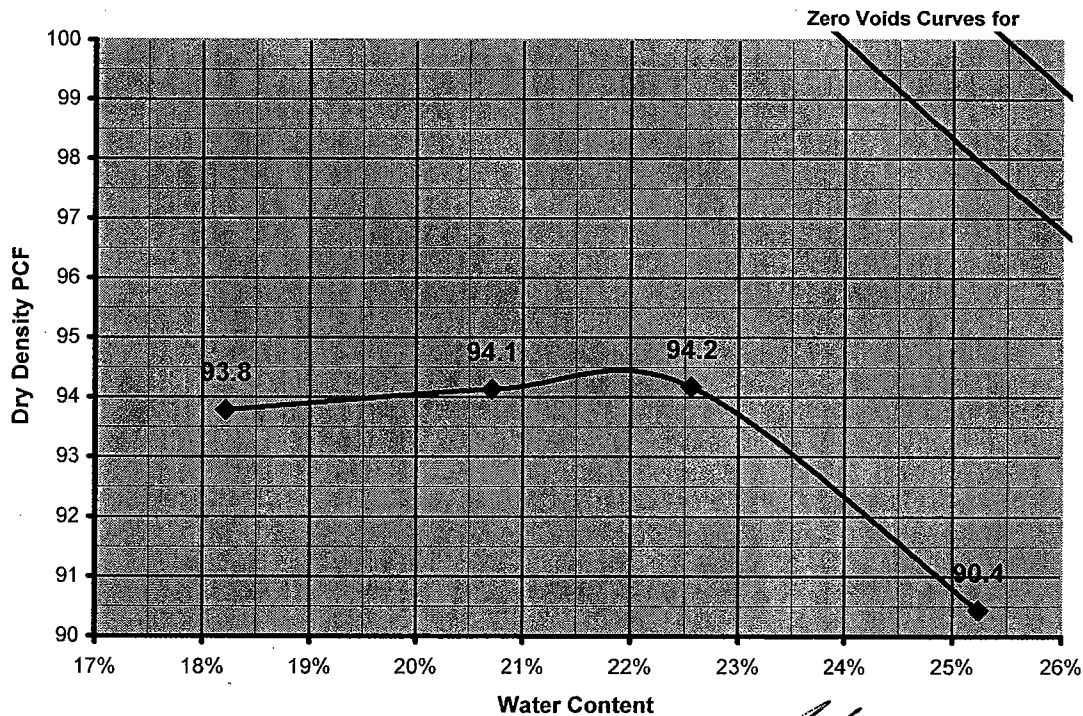
**Standard Proctor:**  
**Modified Proctor:** T-180

### Results:

**Max. Dry Density:** 94.5 PCF  
**Optimum Water %:** 22 %

**Date Tested:** 02/12/05  
**Technician:** AU

**Job Specification:** 100%

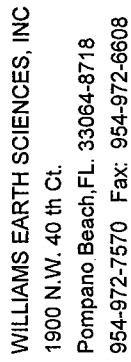


### Copies to:

- 1)
- 2)

**Engineer:**

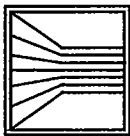
Bensa Nukunya, PhD, PE  
Senior Geotechnical/Materials Engineer  
Florida Registration No. 59440



## PROJECT No.: F304034

PROJECT NAME: STA 5-WORK AREA C

[illegible]



WILLIAMS EARTH SCIENCES, INC  
1900 N.W. 40 th Ct.  
Pompano Beach, FL. 33064-8718  
954-972-7570 Fax: 954-972-6608

## MOISTURE - DENSITY RELATIONSHIP

**Project Name:** STA 5-WORK AREA C  
**Client:** URS  
**Project Number:** F304034  
**Contract Number:**  
**Proctor Number:** S3 +316

### Sample Identification:

**Description:** D.Brown fine sand with l. limerock & organic mat.  
**Location:**  
**Date Sampled:** 01/26/05  
**Source:** EXCV.  
**Material No. :**  
**Passing #4:** 73.7%

**Compaction Method:** Mechanical

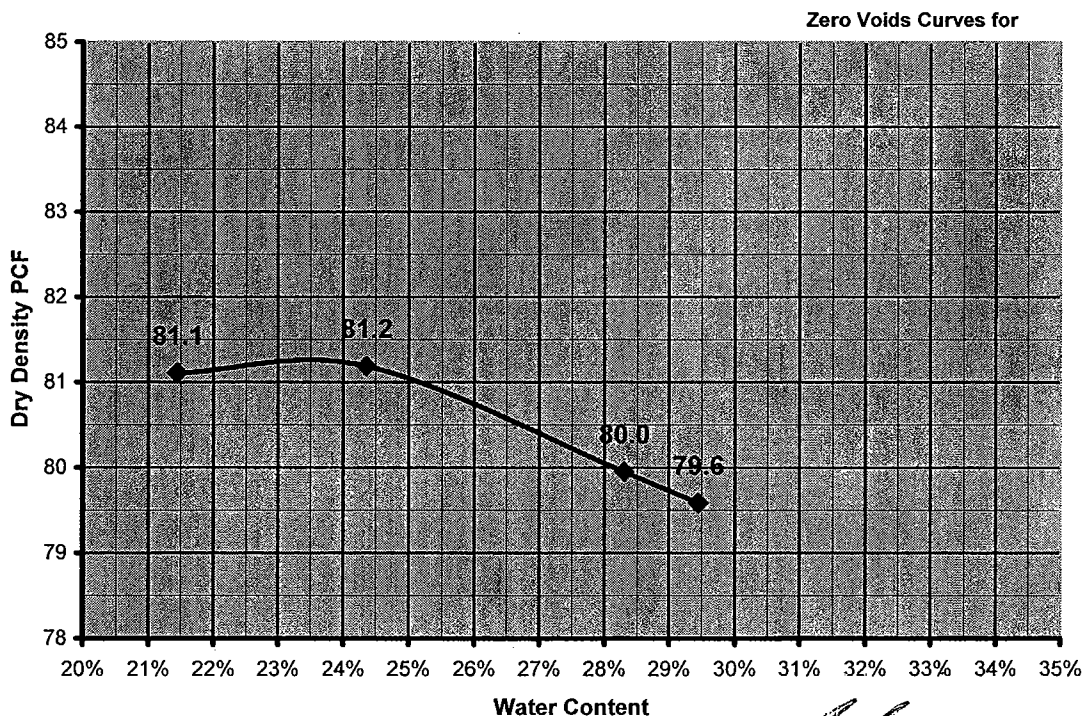
**Standard Proctor:**  
**Modified Proctor:** T-180

### Results:

**Max. Dry Density:** 81.3 PCF  
**Optimum Water %:** 23.5 %

**Date Tested:** 02/12/05  
**Technician:** AU

**Job Specification:** 100%

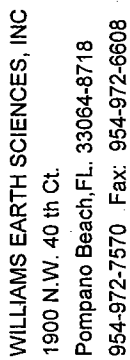


**Copies to:**

- 1)
- 2)

**Engineer:**

Bensa Nukunya, PhD, PE  
Senior Geotechnical/Materials Engineer  
Florida Registration No. 59440



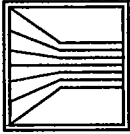
## PROJECT No.: F304034

CLIENT: URS

PROJECT NAME: STA 5-WORK AREA C

DATE	PROCTOR NUMBER (MOD.)	SOIL CLASSIFICATION	MAX DENSITY PGF	OPTIMUM MOISTURE %
1/26/2005	S3 +316		81.3	24

[illegible]



WILLIAMS EARTH SCIENCES, INC  
1900 N.W. 40 th Ct.  
Pompano Beach, FL. 33064-8718  
954-972-7570 Fax: 954-972-6608

## MOISTURE - DENSITY RELATIONSHIP

Project Name: STA 5-WORK AREA C  
Client: URS  
Project Number: F304034  
Contract Number:  
Proctor Number: S-3 +450

### Sample Identification:

Description: D.Brown fine sand with l. limerock  
Location:  
Date Sampled: 01/26/05  
Source: EXCV.  
Material No. :  
Passing #4: 99.4%

Compaction Method: Mechanical

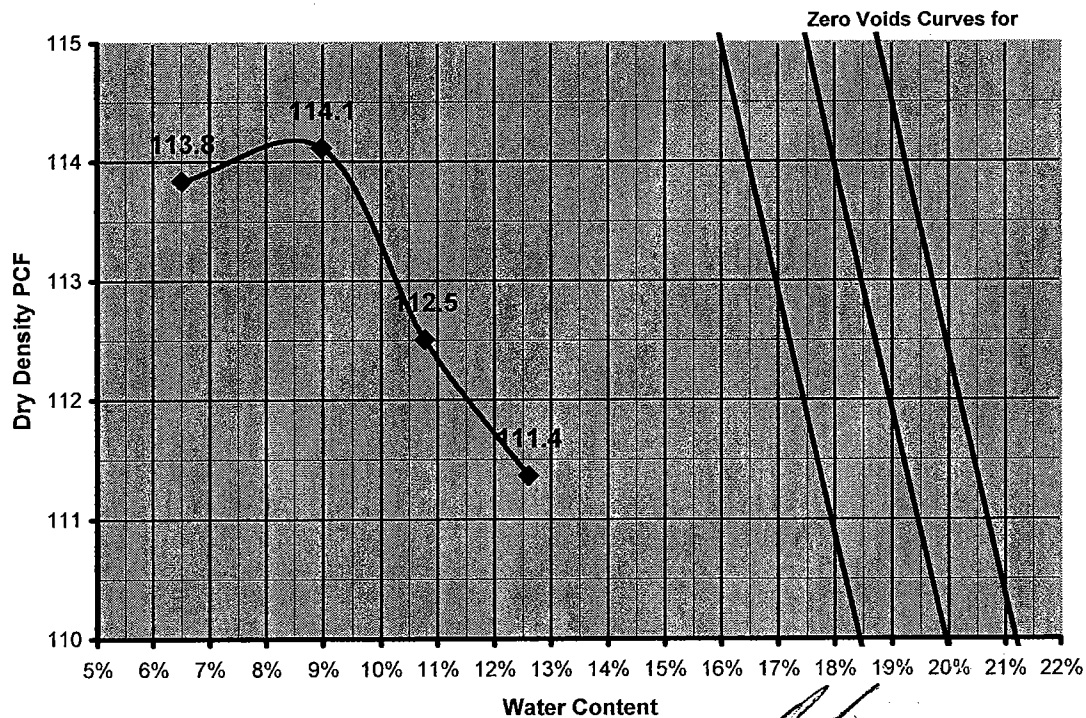
Standard Proctor:  
Modified Proctor: T-180

### Results:

Max. Dry Density: 114.3 PCF  
Optimum Water %: 8.5 %

Date Tested: 02/12/05  
Technician: AU

Job Specification: 100%

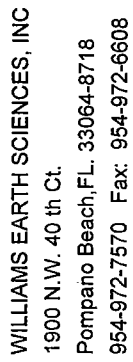


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- 2)

Engineer:

Bensa Nukunya, PhD, PE  
Senior Geotechnical/Materials Engineer  
Florida Registration No. 59440

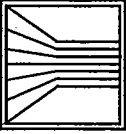


## PROJECT No.: F304034

PROJECT NAME: STA 5-WORK AREA C

DATE	PROCTOR NUMBER (MOD.)	SOIL CLASSIFICATION	MAX DENSITY PCF	OPTIMUM MOISTURE %
1/26/2005	S-3 +450	A-3 (NP)	114.3	9

[illegible]



WILLIAMS EARTH SCIENCES, INC  
1900 N.W. 40 th Ct.  
Pompano Beach, FL. 33064-8718  
954-972-7570 Fax: 954-972-6608

## MOISTURE - DENSITY RELATIONSHIP

**Project Name:** STA 5-WORK AREA C  
**Client:** URS  
**Project Number:** F304034  
**Contract Number:** \_\_\_\_\_  
**Proctor Number:** S-5 +2050

### Sample Identification:

**Description:** D.Brown fine sand with little limerock & organics  
**Location:** \_\_\_\_\_  
**Date Sampled:** 01/27/05  
**Source:** \_\_\_\_\_  
**Material No. :** \_\_\_\_\_  
**Passing #4:** \_\_\_\_\_

**Compaction Method:** Mechanical

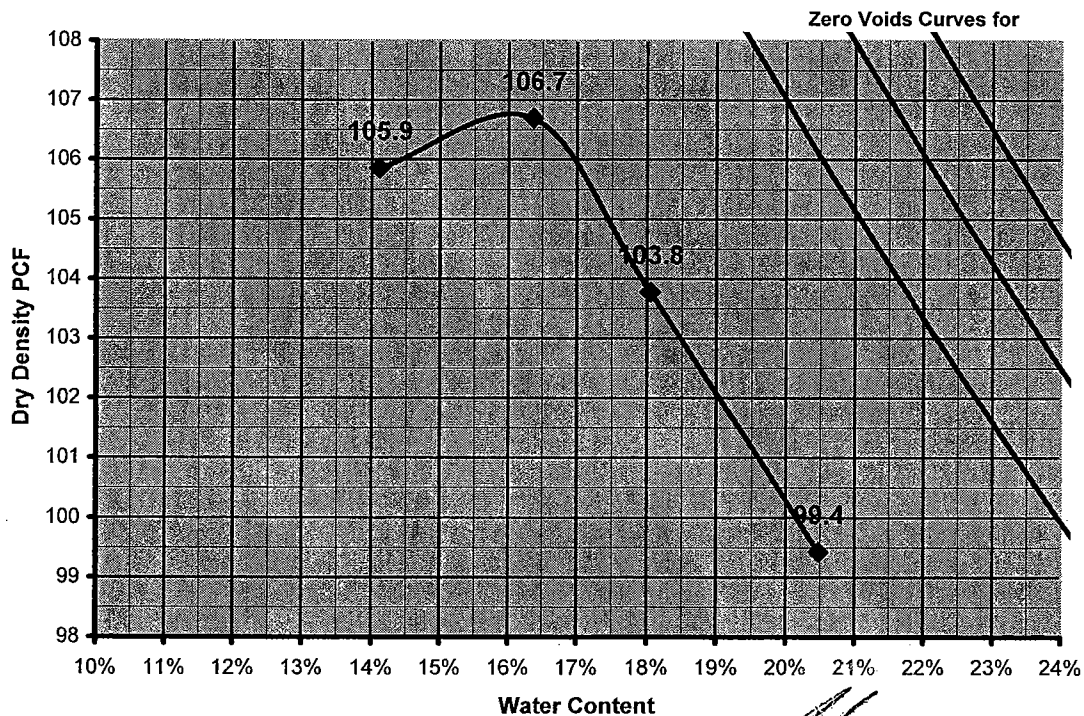
**Standard Proctor:** \_\_\_\_\_  
**Modified Proctor:** T-180

### Results:

**Max. Dry Density:** 106.8 PCF  
**Optimum Water %:** 16 %

**Date Tested:** 02/12/05  
**Technician:** AU


**Job Specification:** 100%

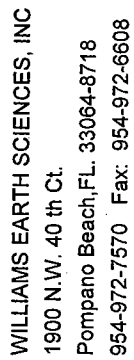


### Copies to:

- 1)
- 2)

### Engineer:

  
Bensa Nukunya, PhD, PE  
Senior Geotechnical/Materials Engineer  
Florida Registration No. 59440



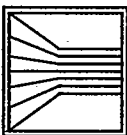
## PROJECT No.: F304034

CLIENT: URS

PROJECT NAME: STA 5-WORK AREA C

DATE	PROCTOR NUMBER (MOD.)	SOIL CLASSIFICATION	MAX. DENSITY PCF	OPTIMUM MOISTURE %	% DENSITY SPEC.	SOURCE	MATERIAL NO.
1/27/2005	S-5 +2050	A-3 (NP)	107	16	100%	0	0%

[illegible]



WILLIAMS EARTH SCIENCES, INC  
1900 N.W. 40 th Ct.  
Pompano Beach, FL. 33064-8718  
954-972-7570 Fax: 954-972-6608

## MOISTURE - DENSITY RELATIONSHIP

Project Name: STA 5-WORK AREA C  
Client: URS  
Project Number: F304034  
Contract Number:  
Proctor Number: S7 +450

### Sample Identification:

Description: D.Brown fine sand with little limerock & organics  
Location:  
Date Sampled: 01/27/05  
Source:  
Material No. :  
Passing #4:

Compaction Method: Mechanical

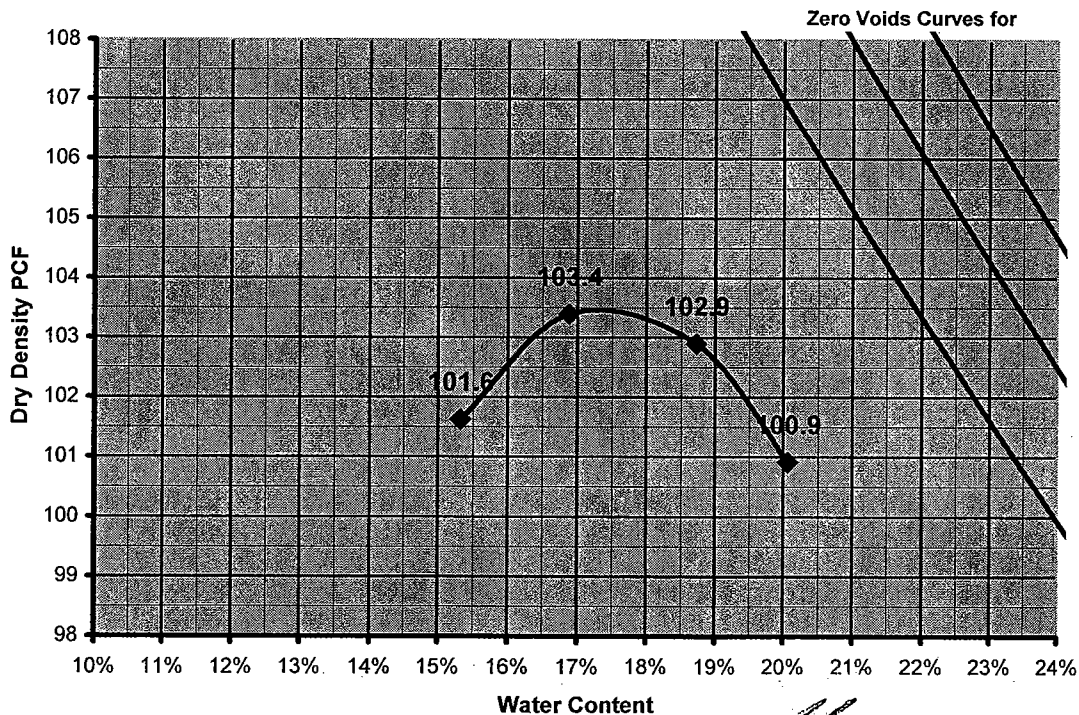
Standard Proctor:  
Modified Proctor: T-180

### Results:

Max. Dry Density: 103.5 PCF  
Optimum Water %: 17.5 %

Date Tested: 02/12/05  
Technician: AU

### Job Specification:

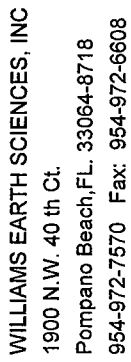


### Copies to:

- 1)
- 2)

Engineer:

Bensa Nukunya, PhD, PE  
Senior Geotechnical/Materials Engineer  
Florida Registration No. 59440



## PROJECT No.: F304034

CLIENT: URS

PROJECT NAME: STA 5-WORK AREA C

DATE	PROCTOR NUMBER (MOD.)	SOIL CLASSIFICATION	MAX DENSITY PCF	OPTIMUM MOISTURE %	% DENSITY SPEC.	SOURCE	MATERIAL NO.
1/27/2005	S7 +450	A-3 (NP)	104	18	100%	0	0%

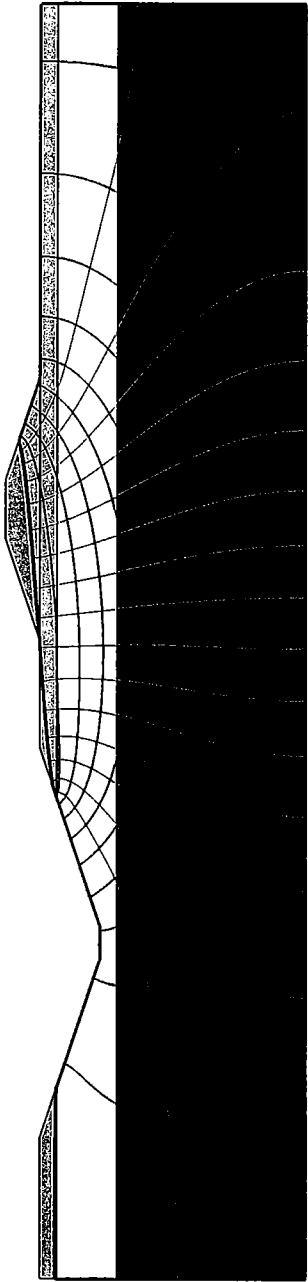
[illegible]

# **APPENDIX D**

## **SEEPAGE ANALYSES**

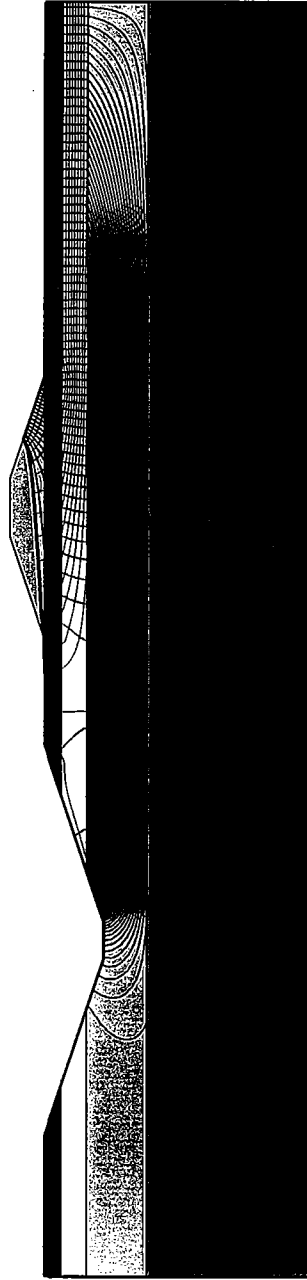
SFWMD STA 5 EXPANSION - BORING CB-12







Total Flowrate = 1.4796 (ft<sup>3</sup>/d)/(ft)



- Materials
- FILL ( $K_f=0.4ft/day$ )
  - SAND ( $K_f=0.6ft/day$ )
  - LIMESTONE ( $K_f=0.86ft/day$ )
  - CLAYEY SAND ( $K_f=0.15ft/day$ )

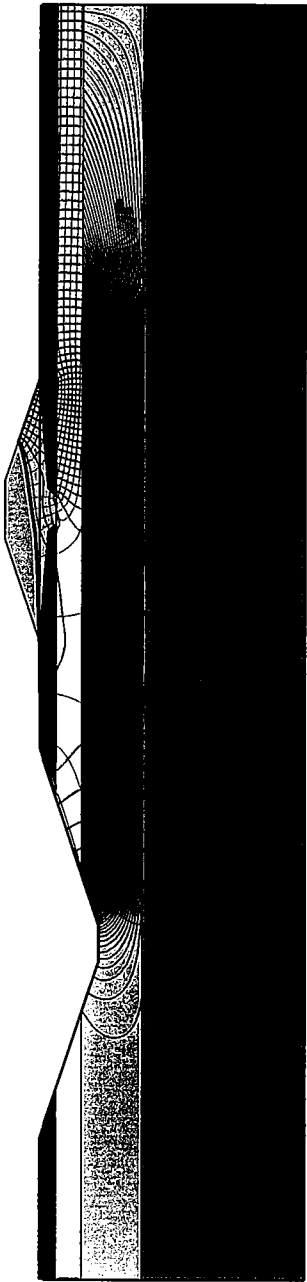
SFWMD STA 5 EXPANSION - BORING CB-28  
Total Flowrate = 5.0866(ft<sup>3</sup>/s)/(ft)



Materials	
	FILL (Kf=0.4ft/day)
	COMPACTED MUCK (Kf=0.1ft/day)
	INSITU MUCK (Kf=26ft/day)
	LIMESTONE AND SAND (Kf=0.52ft/day)
	SAND (Kf=5ft/day)
	CLAYEY SAND (Kf=0.22ft/day)

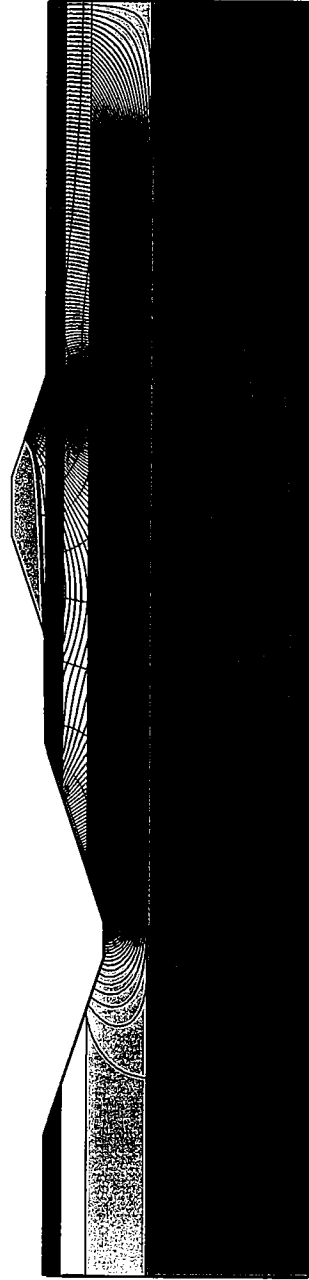








SFVMD STA 5 EXPANSION - BORING CB-28  
Total Flowrate = 7.5297 (ft<sup>3</sup>/d)/(ft)



SFWMD STA 5 EXPANSION - BORING CB-28

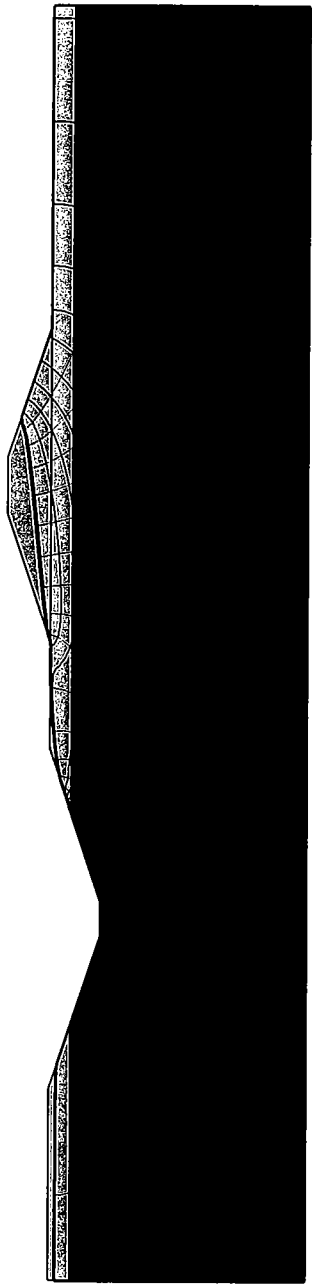
Total Flowrate = 10.6309 (ft<sup>3</sup>/d)/(ft)



Materials	
	FILL (Kh=0.4ft/day)
	COMPACTED MUCK (Kh=1.6ft/day)
	INSITU MUCK (Kh=26ft/day)
	LIMESTONE AND SAND (Kh=0.52ft/day)
	SAND (Kh=5ft/day)
	CLAYEY SAND (Kh=0.22ft/day)

1

SFVWMD STA 5 EXPANSION - BORING CB-33  
Total Flowrate = 2.0612 (ft<sup>3</sup>/d)/(ft)



Materials  
FILL (K<sub>f</sub>=0.4ft/day)  
SAND (K<sub>f</sub>=0.6ft/day)  
CLAYEY SAND (K<sub>f</sub>=0.2ft/day)

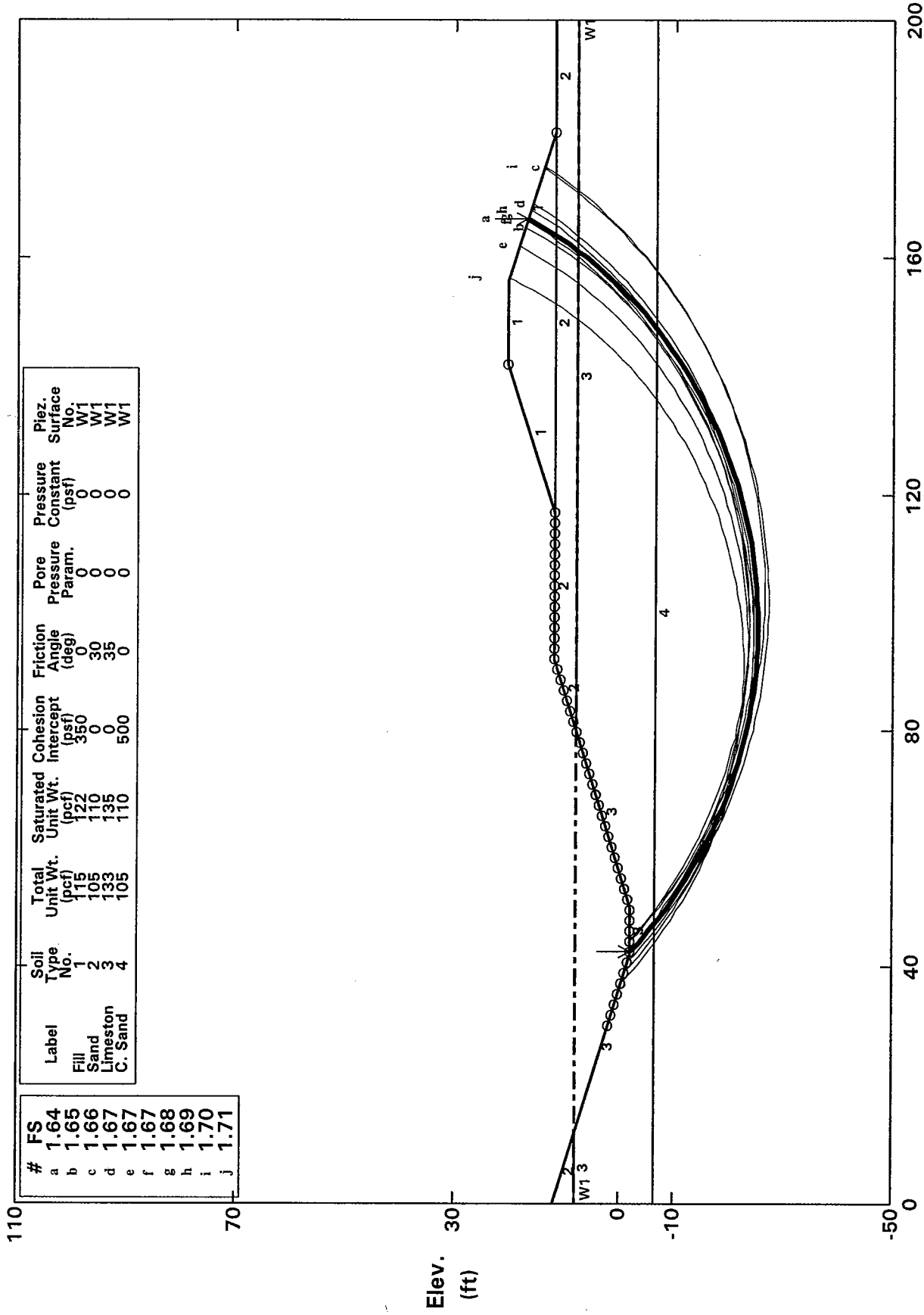


## **APPENDIX E**

### **SLOPE STABILITY ANALYSES**

# SFWMD STA 5 EXPANSION CB-12 E.O.C.

Ten Most Critical. C:CB-12EC.PLT By: Braulio Grajales 2/03/2005 5:45pm

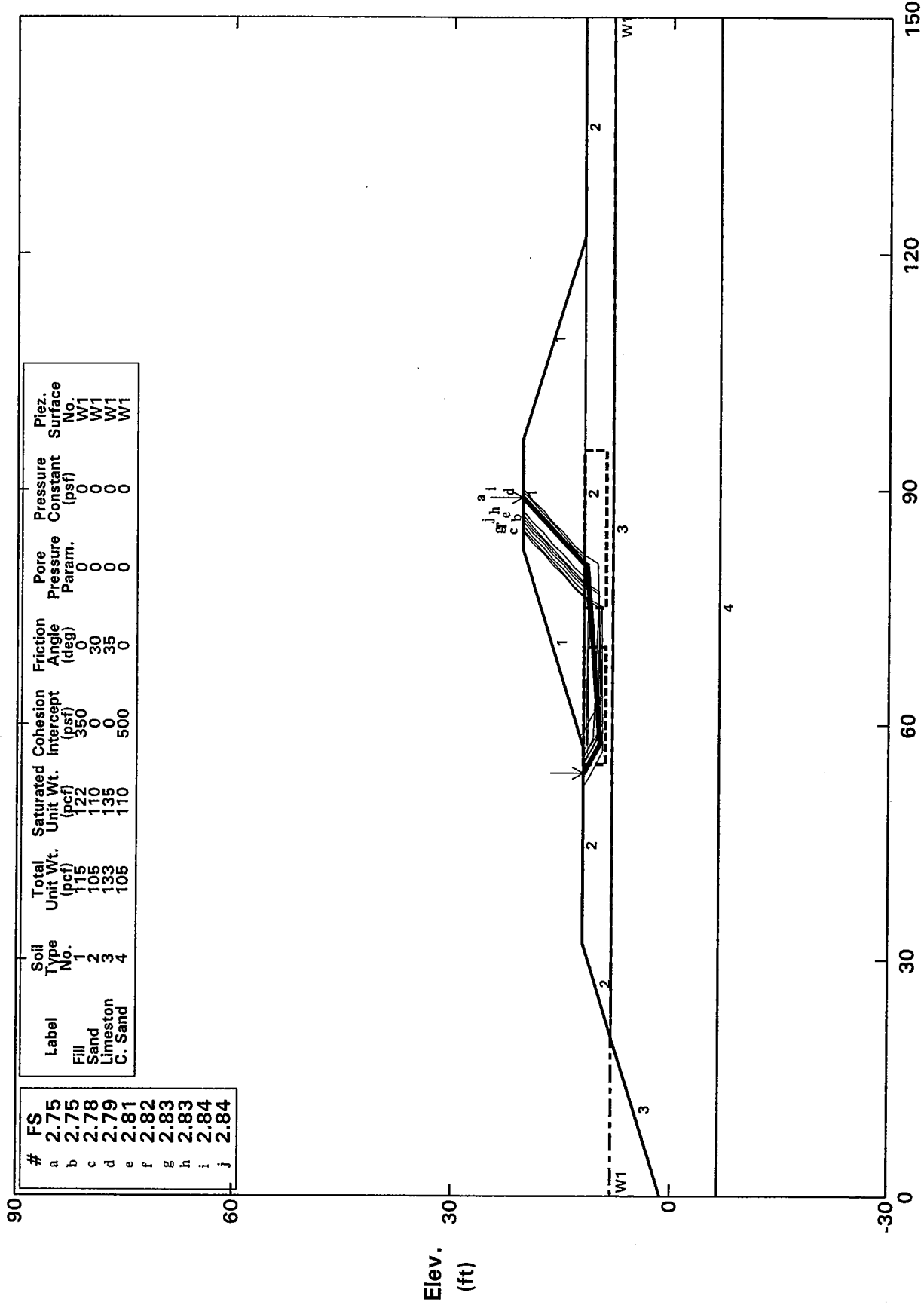


PCSTABL5M/SI FSmin = 1.64 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 (PANSION CB-12 E.O.C.

Ten Most Critical. C:CB-12ECW.PLT By: Braulio Grajales 2/03/2005 5:45pm

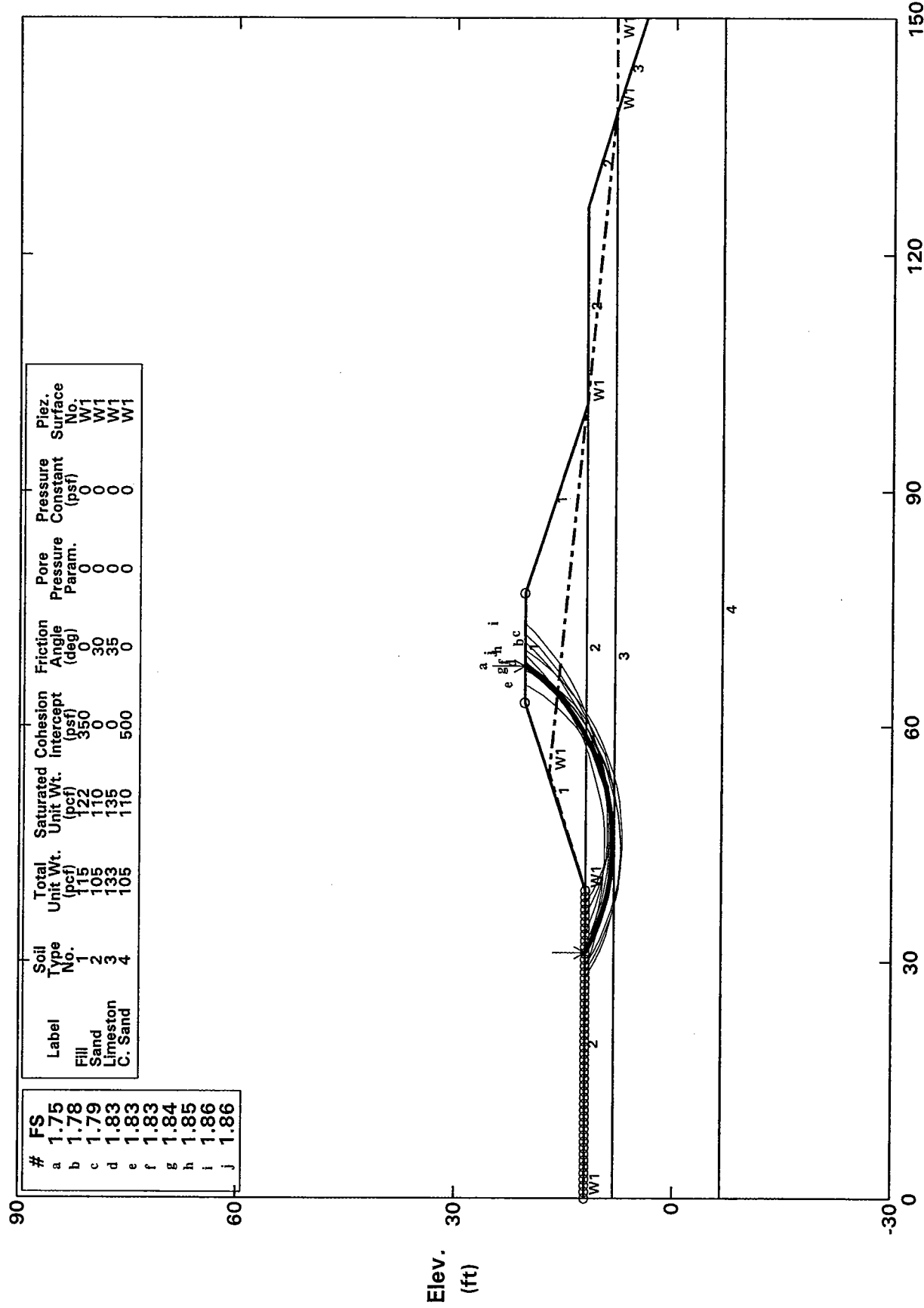


PCSTABL5M/SI FSmin = 2.75 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION CB-12 R.D.

Ten Most Critical. C:CB-12RD.PLT By: Braulio Grajales 2/03/2005 6:35pm

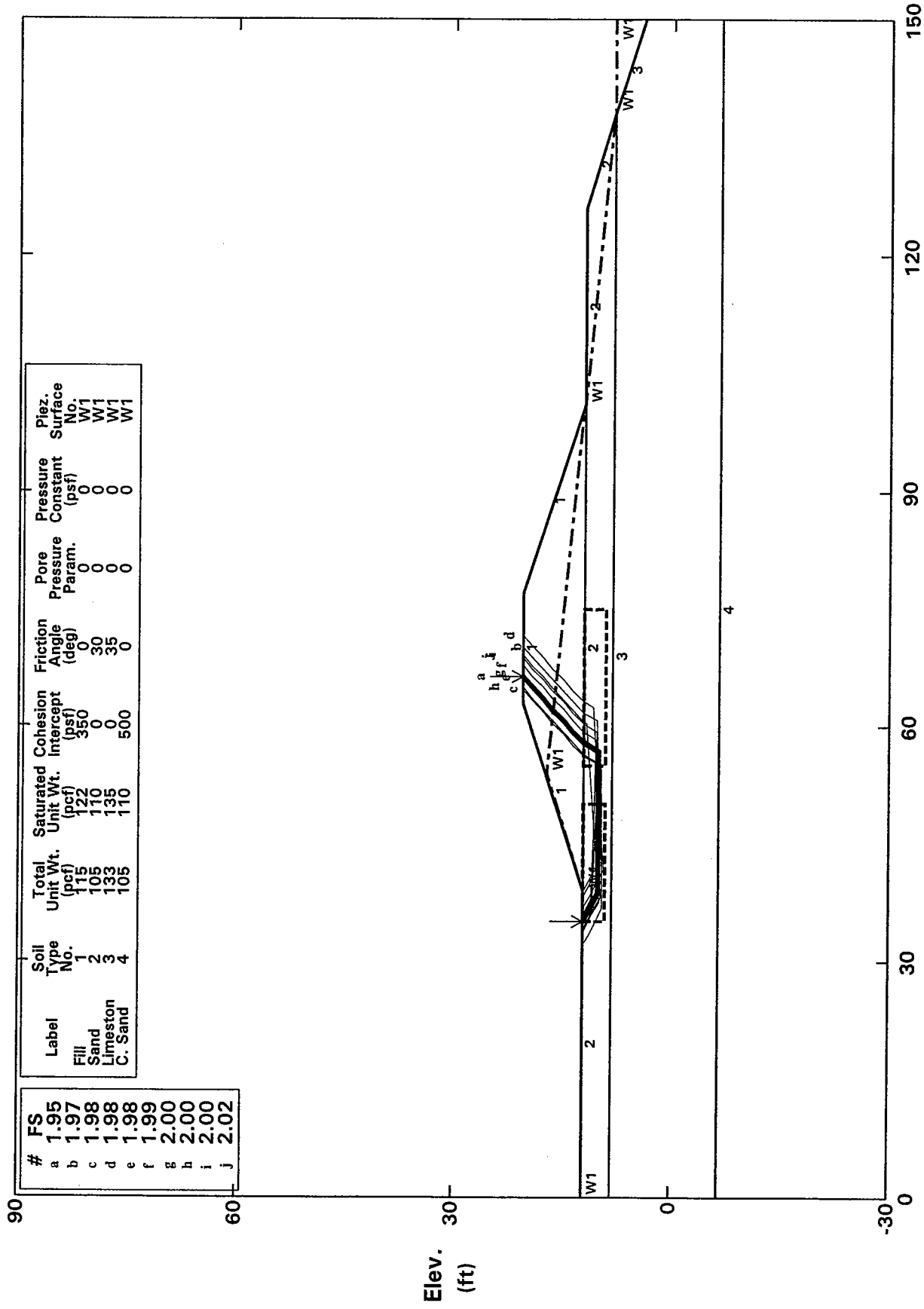


PCSTABL5M/SI FSmin = 1.75 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 12+00 EXPANSION CB-12 R.D.

Ten Most Critical. C:CB-12RDW.PLT By: Braulio Grajales 2/08/2005 12:41pm

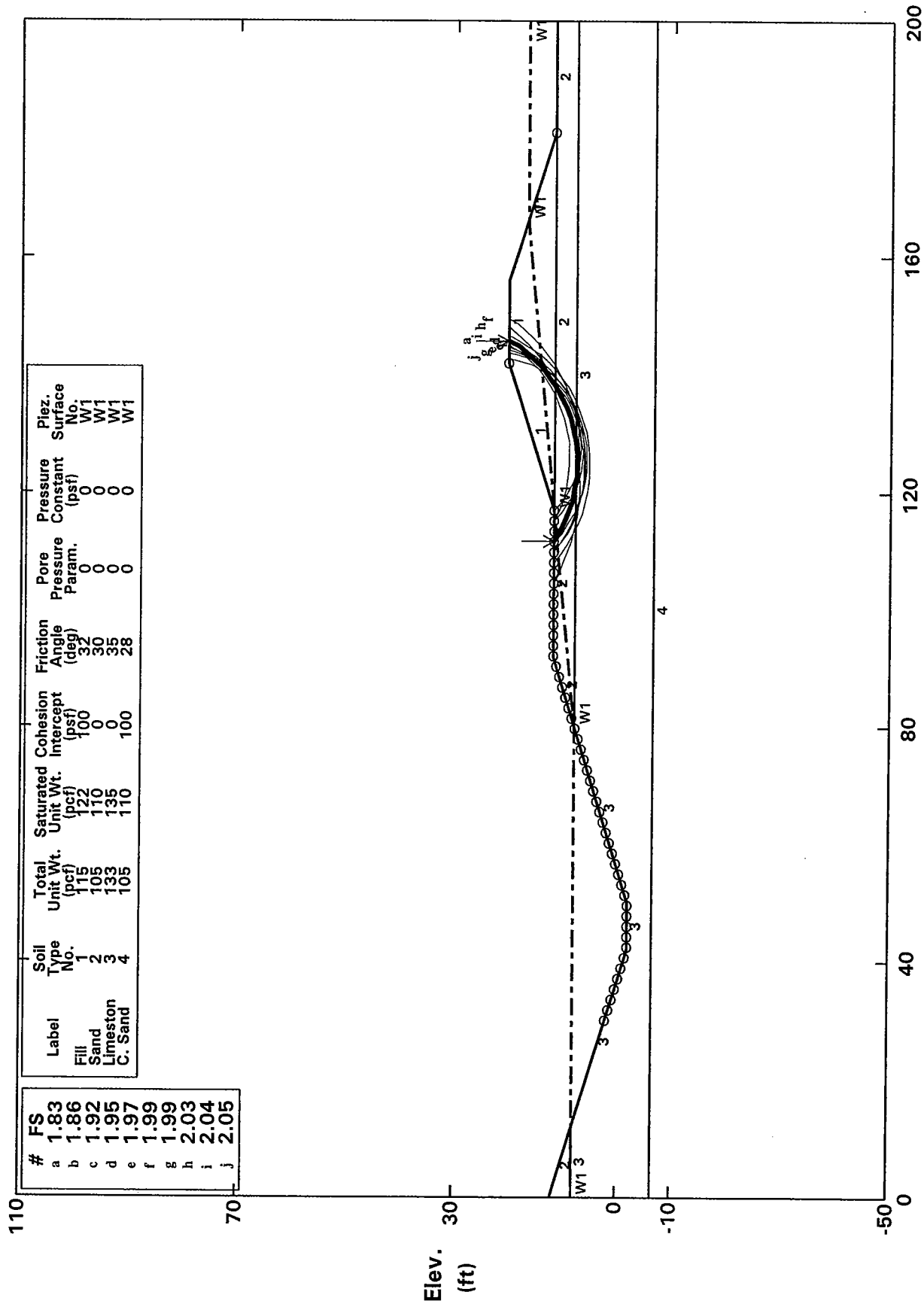


PCSTABL5M/SI FSmin = 1.95 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 12XPANSION CB-12 S.S.

Ten Most Critical. C:CB-12SS.PLT By: Braulio Grajales 2/03/2005 5:47pm



PCSTABL5M/SI FSmin = 1.83 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION CB-12 S.S.

g:\296\38615215 sfwmd\geotech\pcstbl\addtl\cb-12ssw.pl2 4/14/2005 11:09am

110

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.97	Fill	1	115.0	122.0	100.0	32.0	W1
b	1.98	Sand	2	105.0	110.0	0.0	30.0	W1
c	2.03	Limestone	3	133.0	135.0	0.0	35.0	W1
d	2.05	C. Sand	4	105.0	110.0	100.0	28.0	W1

e	2.10
f	2.12
g	2.15
h	2.17
i	2.18

70

30

0

-10

-50

200

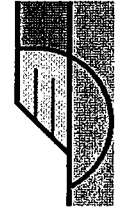
160

120

80

40

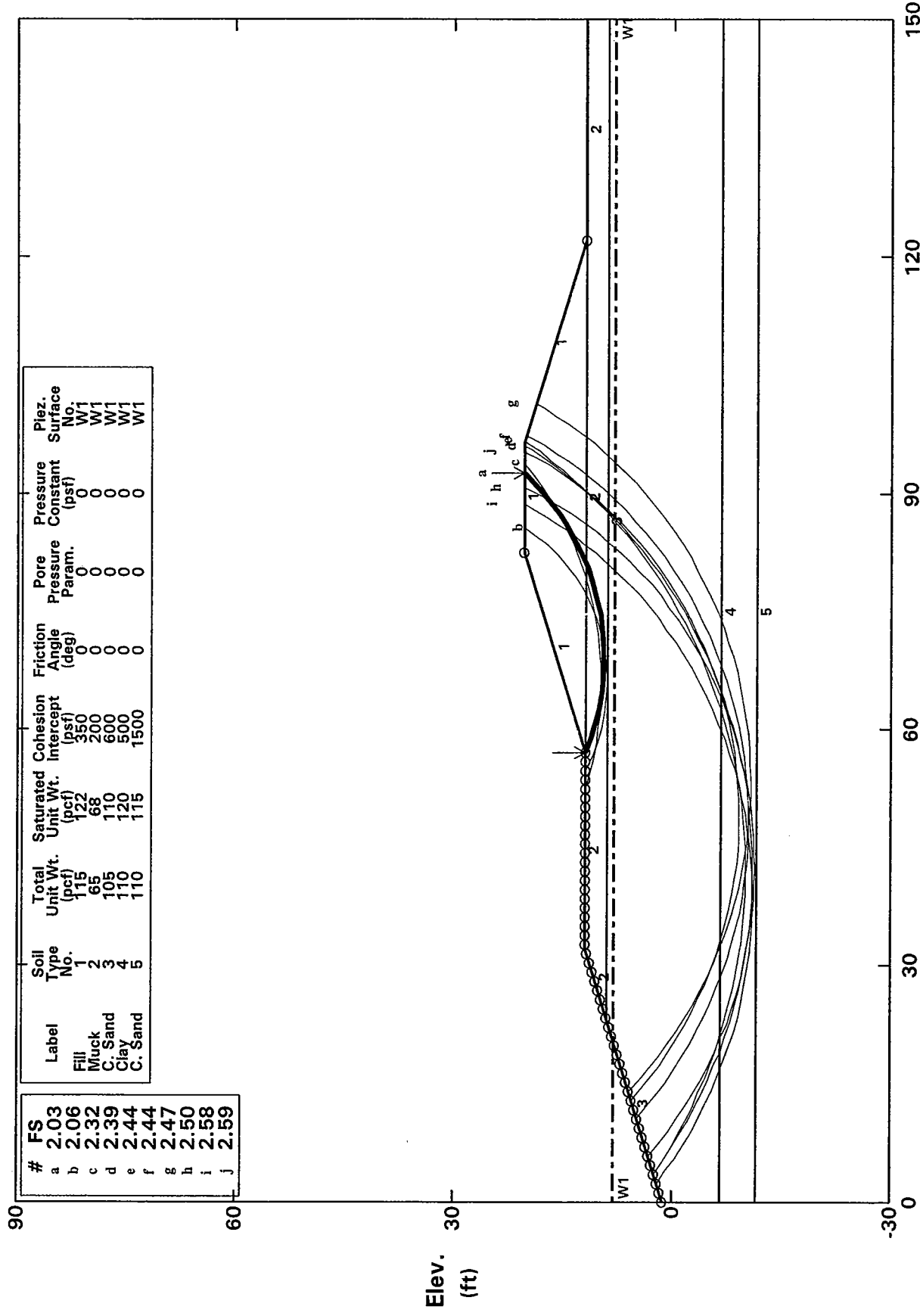
STED



PCSTABL5M/si FSmin=1.97  
Safety Factors Are Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION CB-16 E.O.C.

Ten Most Critical. C:CB-16EC.PLT By: Braulio Grajales 2/03/2005 4:43pm



PCSTABL5M/SI FSmin = 2.03 X-Axis (ft)

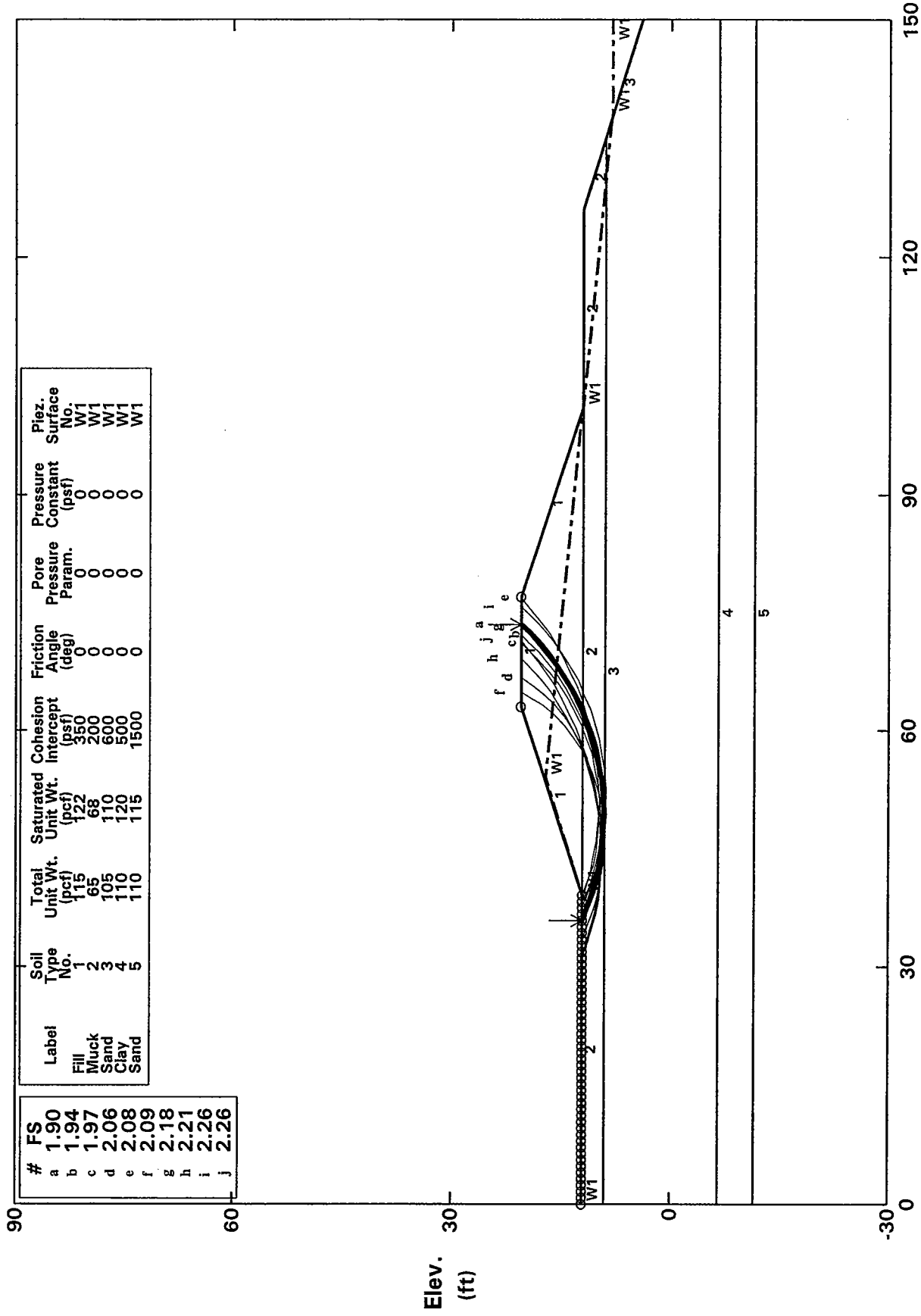
Factors Of Safety Calculated By The Modified Janbu Method

Ten Most Critical. C:CB-16ECW.PLT By: Braulio Grajales 2/03/2005 4:46pm



# SFWMD STA 10+00 EXPANSION CB-16 R.D.

Ten Most Critical. C:CB-16RD.PLT By: Braulio Grajales 2/03/2005 6:39pm

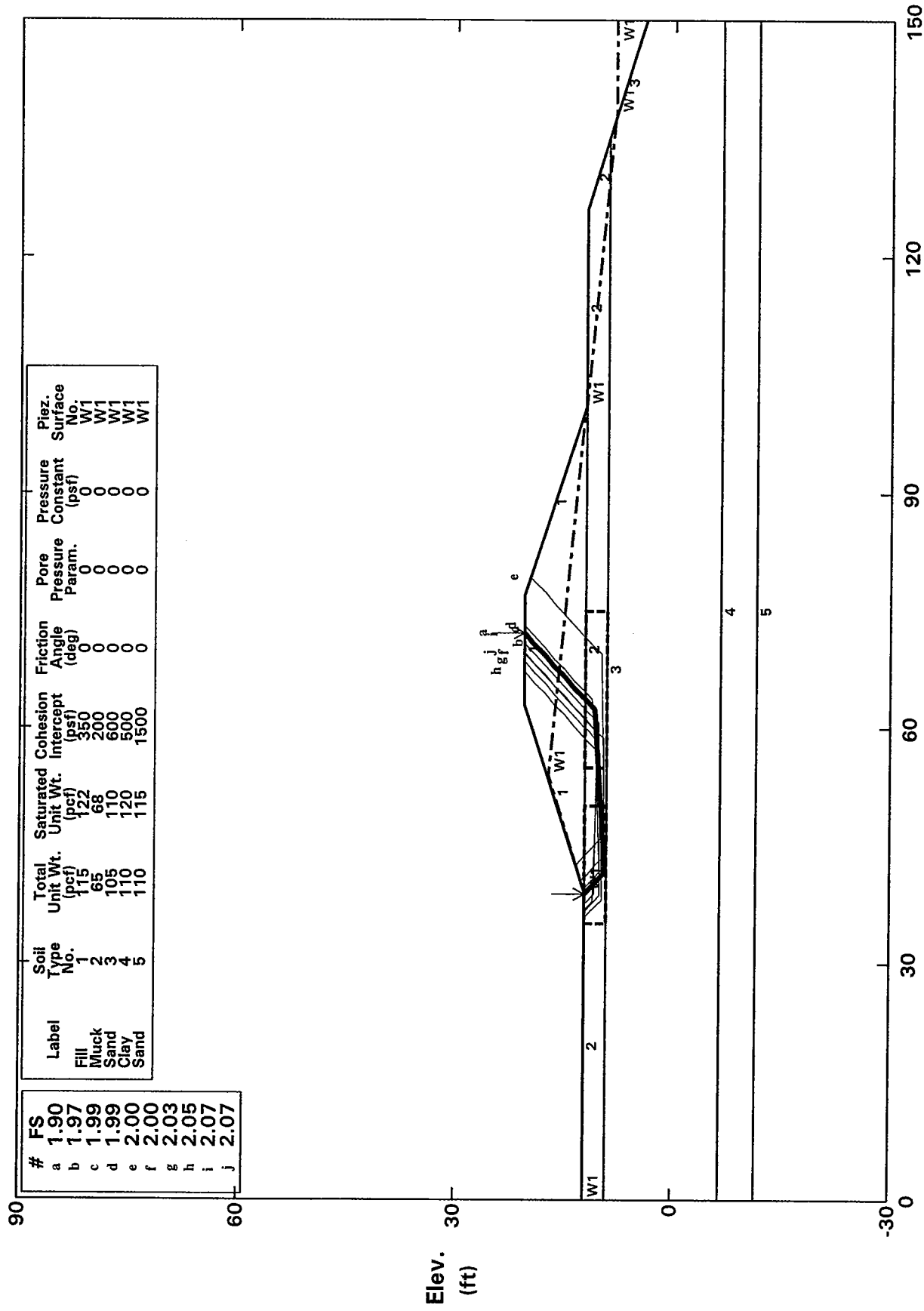


PCSTABL5M/SI FSmin = 1.90 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION CB-16 R.D.

Ten Most Critical. C:CB-16RDW.PLT By: Braulio Grajales 2/03/2005 6:39pm

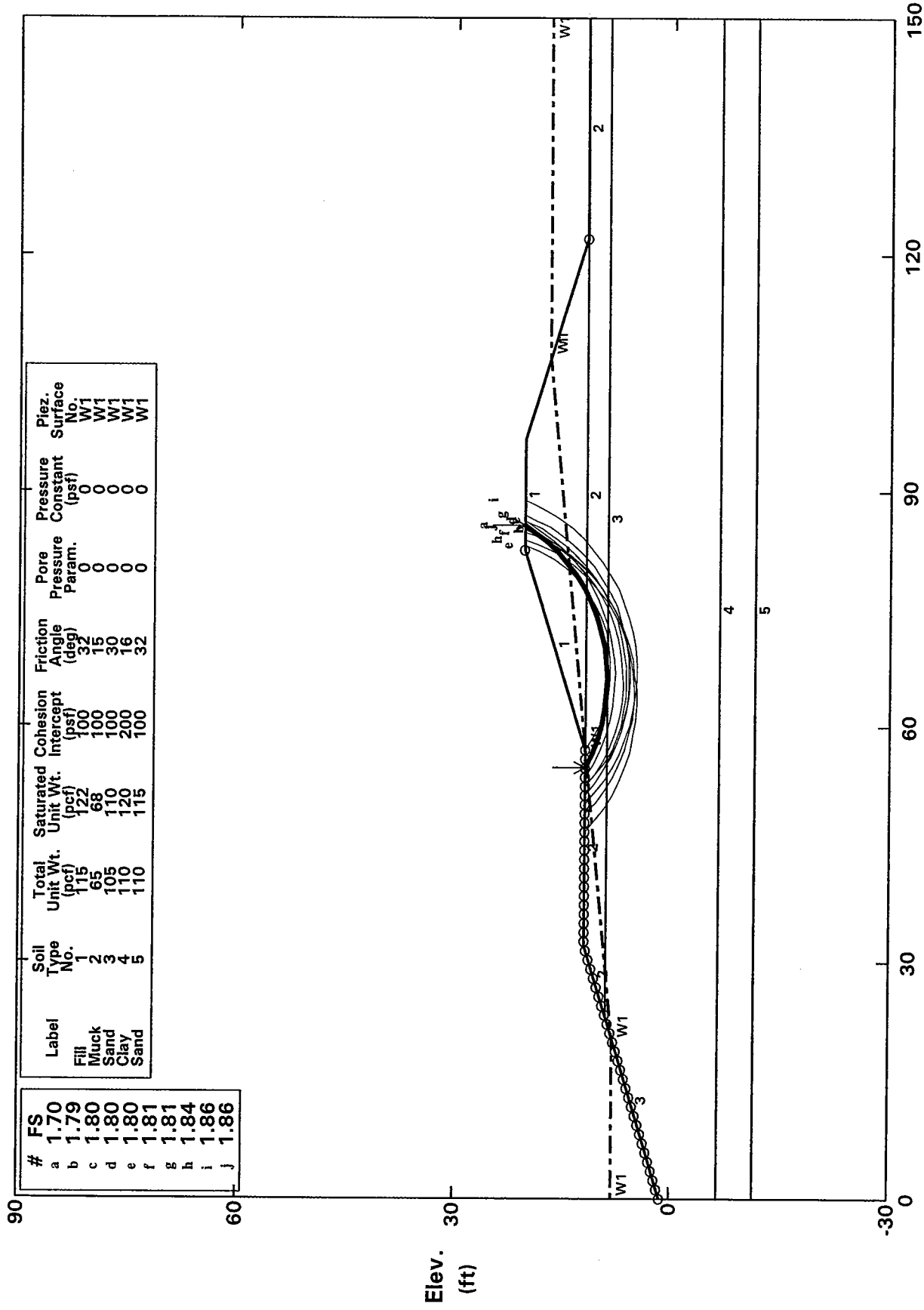


PCSTABL5M/SI FSmin = 1.90 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION CB-16 S.S

Ten Most Critical. C:CB-16SS.PLT By: Braulio Grajales 2/03/2005 5:43pm

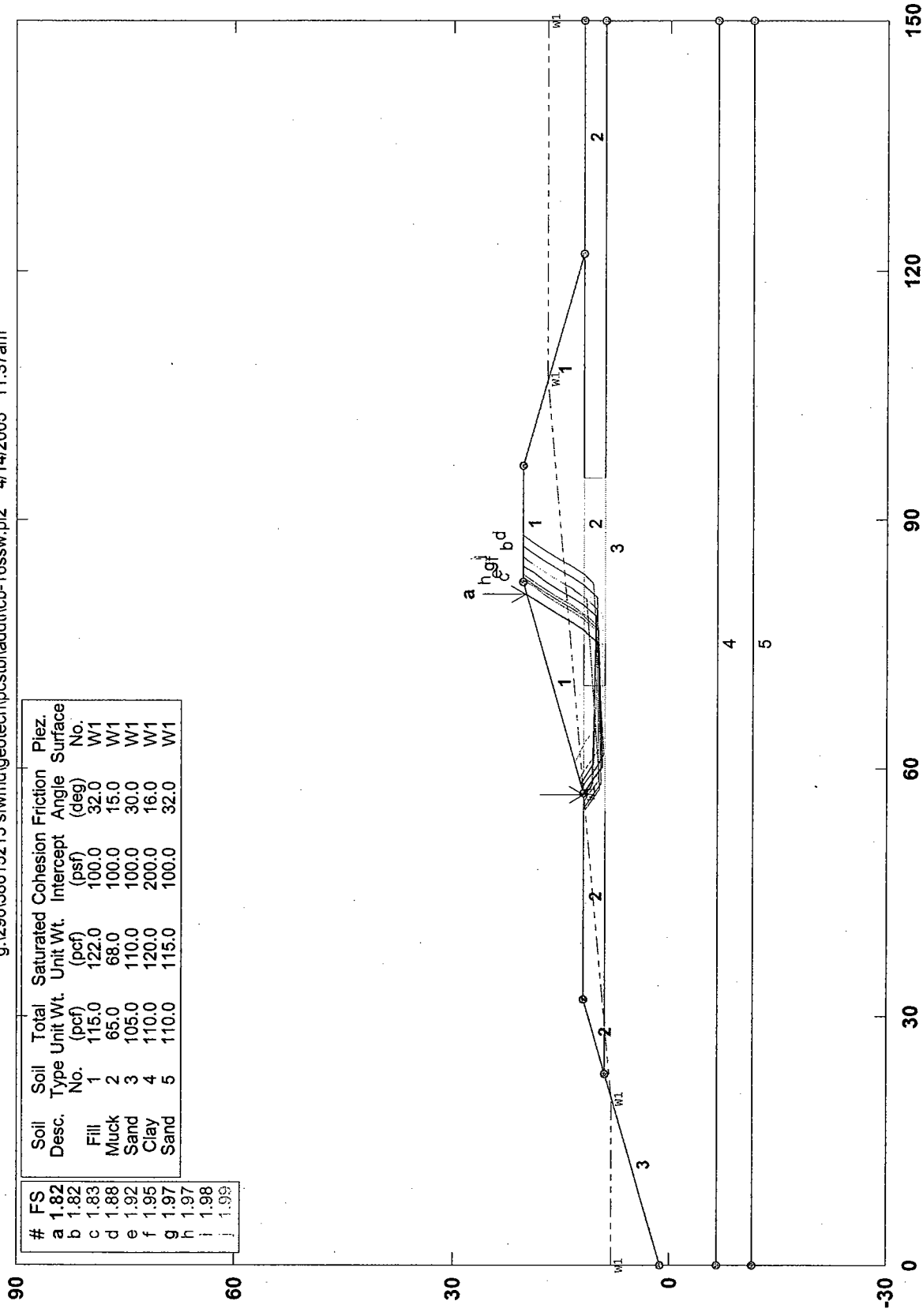


PCSTABL5M/SI FSmin = 1.70 X-Axis (ft)

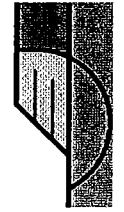
Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION CB-16 S.S

g:\296\38615215 sfwmd\geotech\pcstbl\addtl\cb-16ssw.pl2 4/14/2005 11:37am



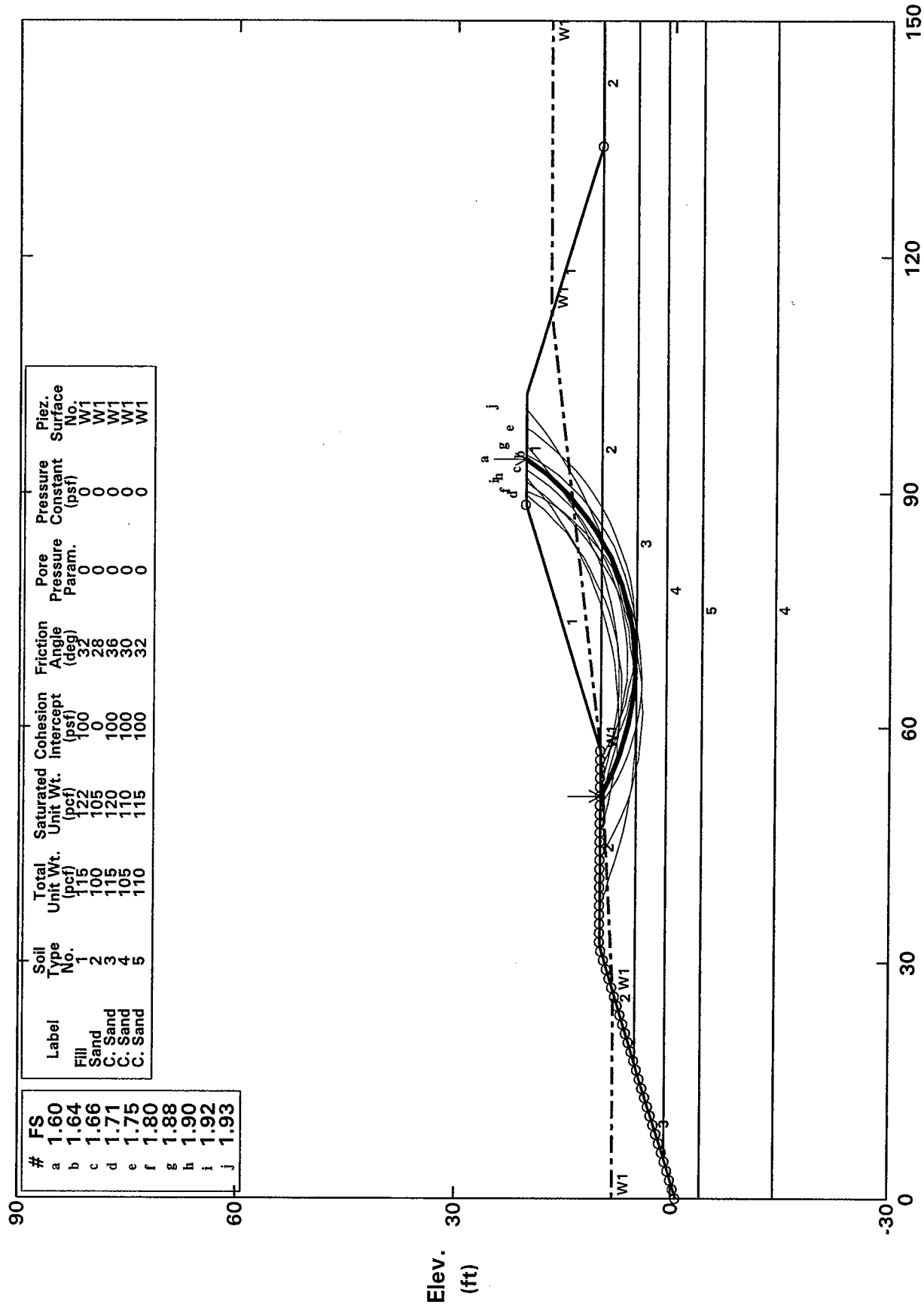
STED



PCSTABL5M/si FSmin=1.82  
Safety Factors Are Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION CB-33 S.S.

Ten Most Critical. C:CB-33SS.PLT By: Braulio Grajales 4/14/2005 4:35pm

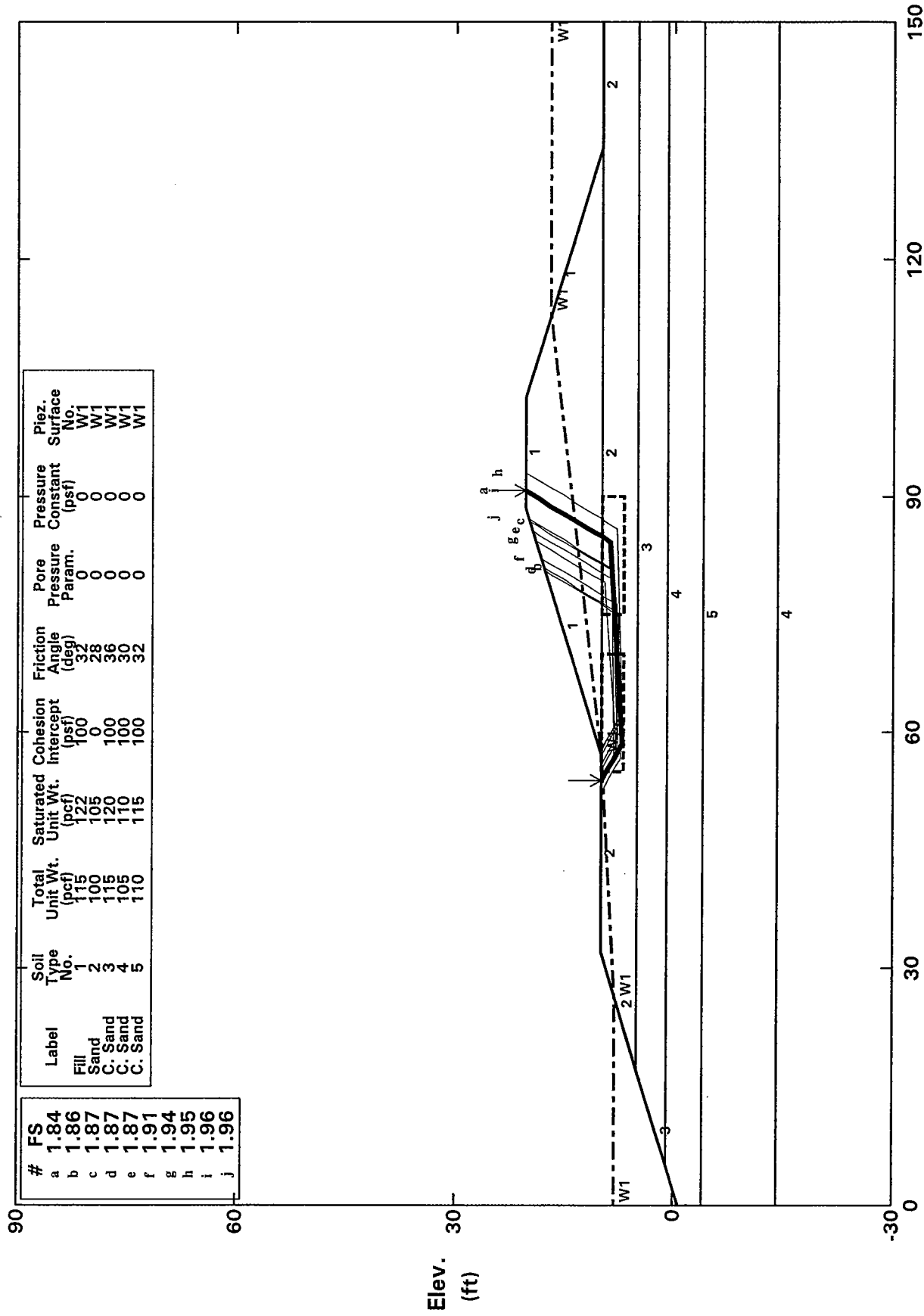


PCSTABL5M/SI FSmin = 1.60 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 10+00 EXPANSION CB-33 S.S.

Ten Most Critical. C:CB-33SSW.PLT By: Braulio Grajales 4/14/2005 4:35pm

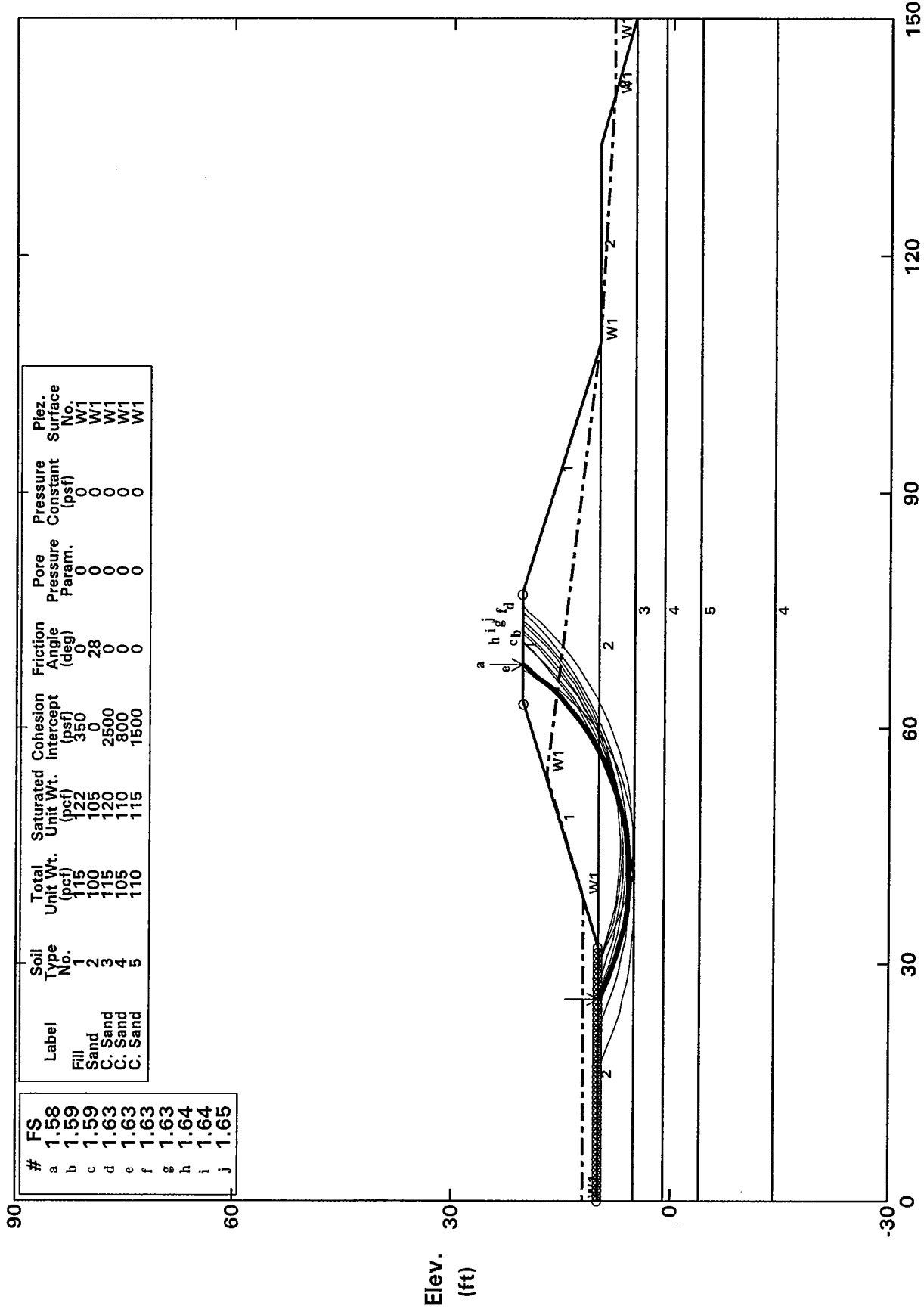


PCSTABL5M/SI FSmin = 1.84 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA CXPANSION CB-33 R.D.

Ten Most Critical. C:CB-33RD.PLT By: Braulio Grajales 4/14/2005 4:36pm

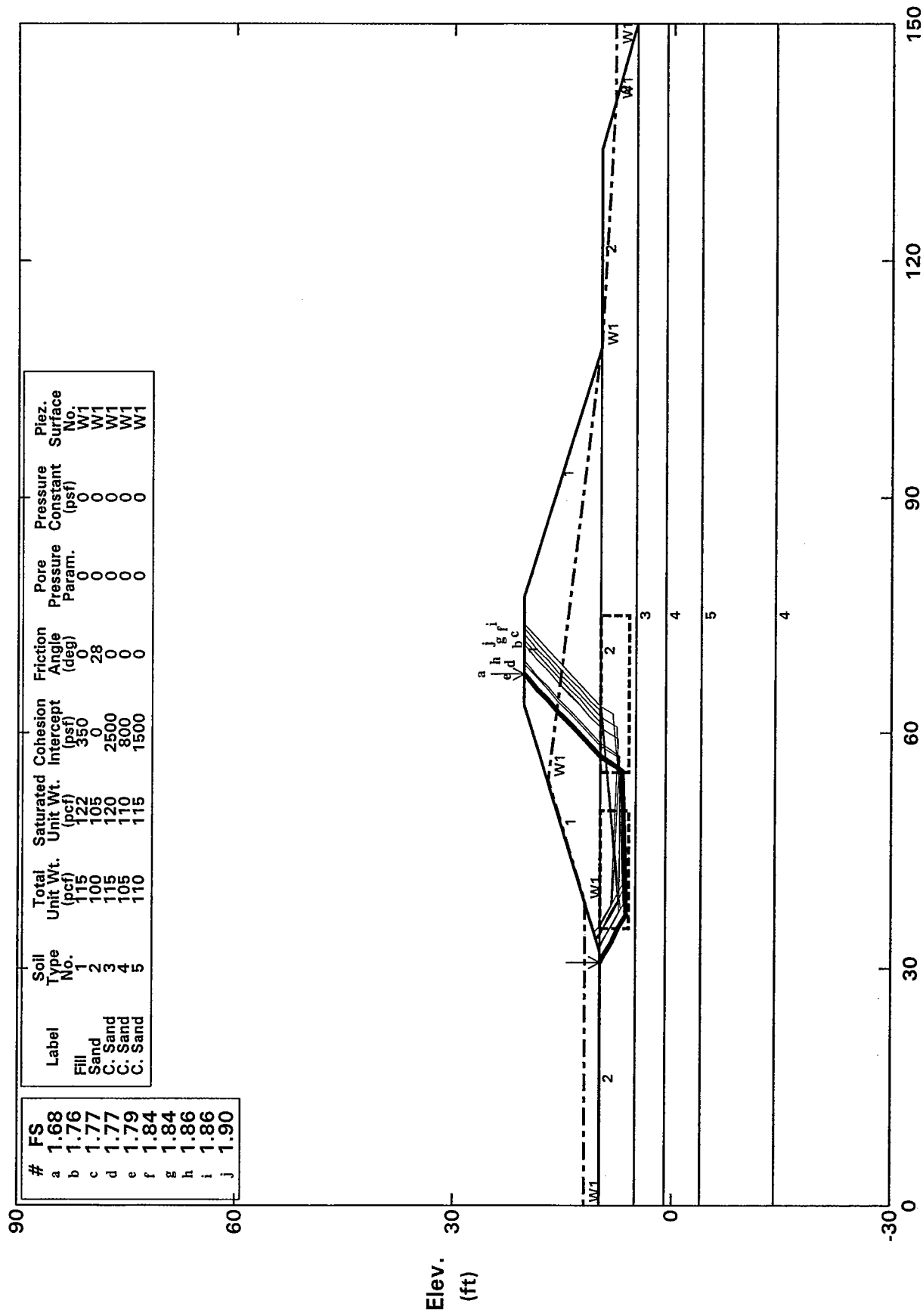


PCSTABL5M/SI FSmin = 1.58 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA. XPANSION CB-33 R.D.

Ten Most Critical. C:CB-33RDW.PLT By: Braulio Grajales 4/14/2005 4:36pm

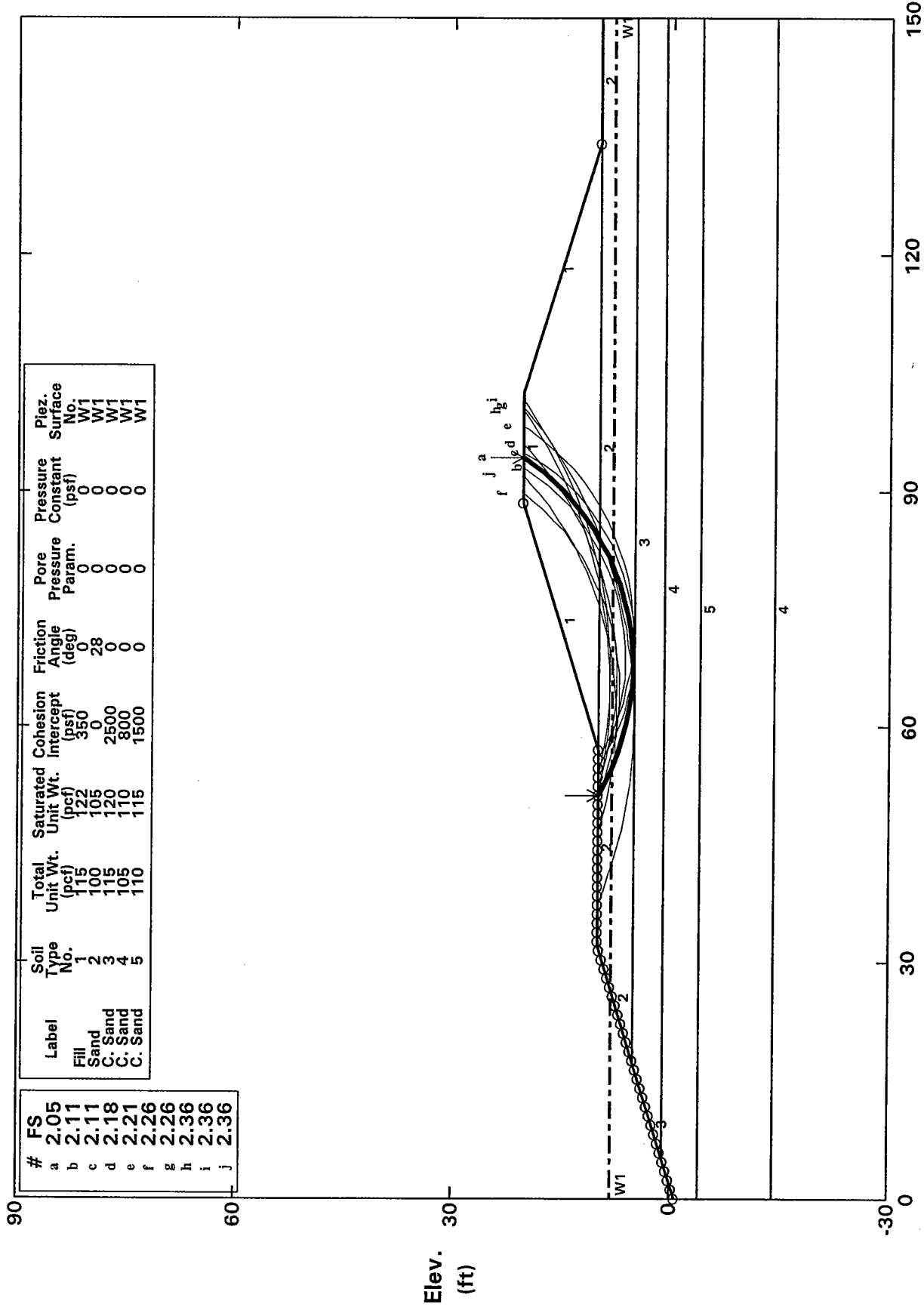


PCSTABL5M/SI FSmin = 1.68 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 (PANSION CB-33 E.O.C.

Ten Most Critical. C:CB-33EC.PLT By: Braulio Grajales 4/14/2005 4:37pm

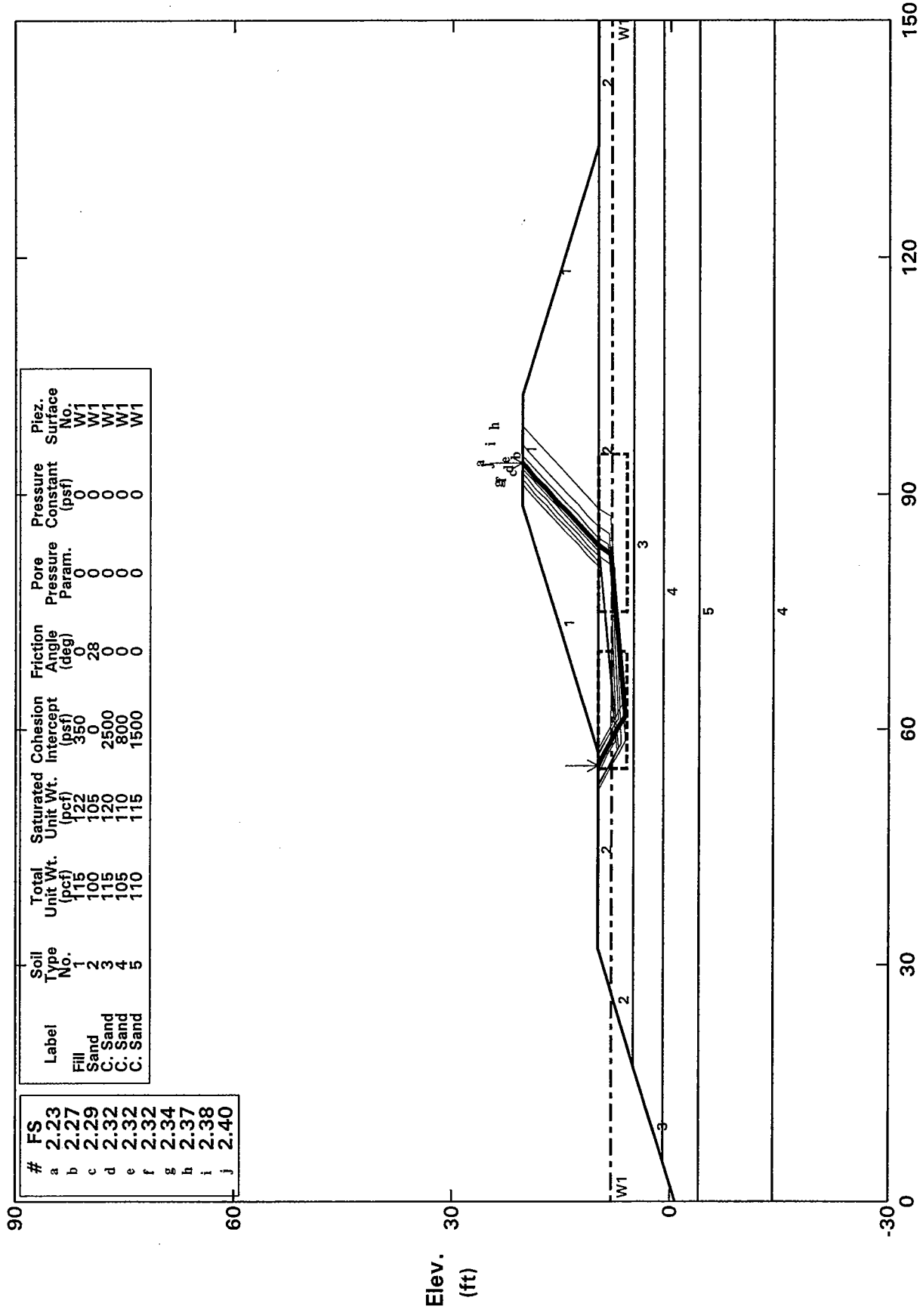


PCSTABL5M/SI FSmin = 2.05 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 PANSION CB-33 E.O.C.

Ten Most Critical. C:CB-33ECW.PLT By: Braulio Grajales 4/14/2005 4:37pm

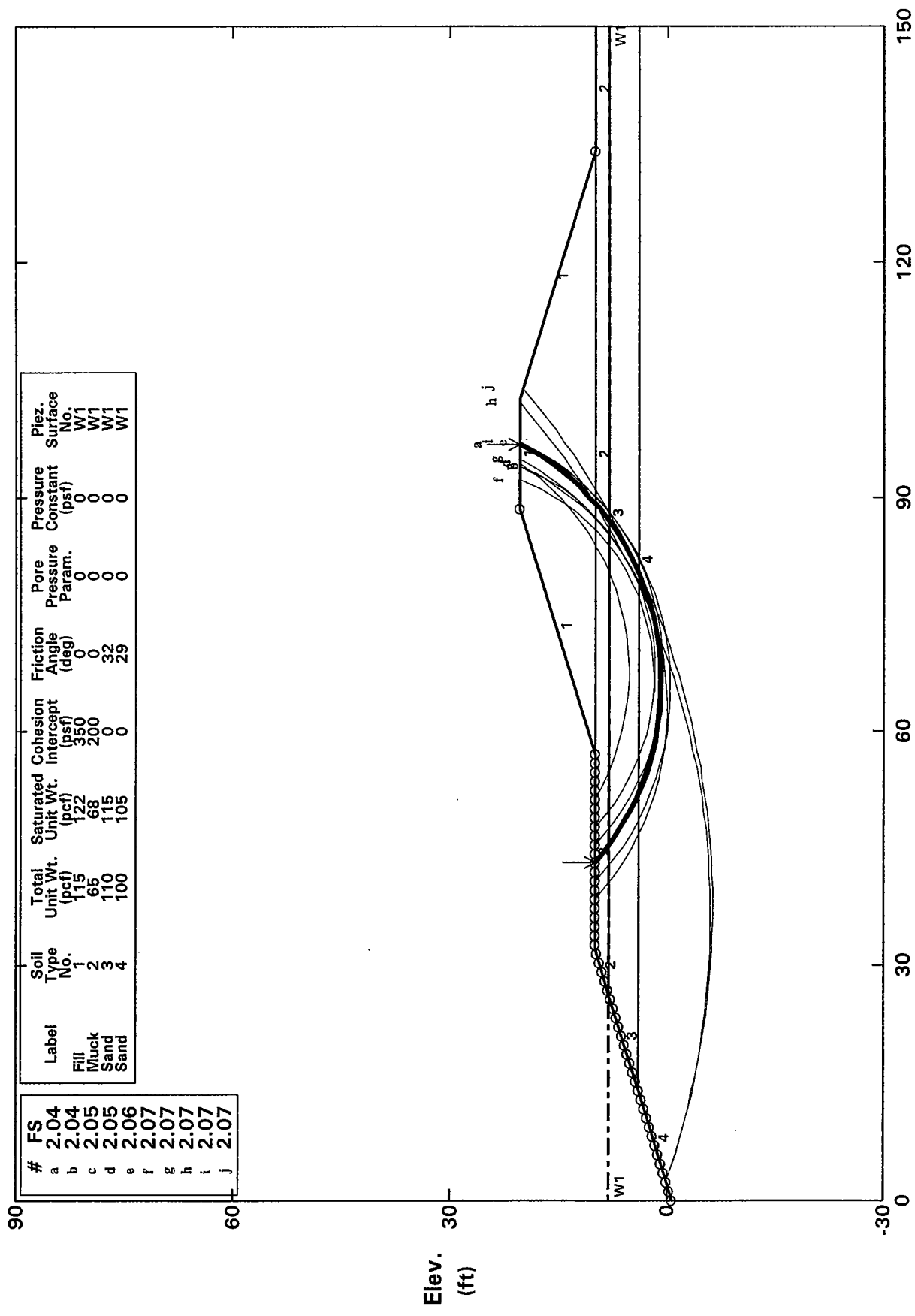


PCSTABL5M/SI FSmin = 2.23 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 1+000 EXPANSION TB-3 E.O.C.

Ten Most Critical. C:TB-3EC.PLT By: Braulio Grajales 2/03/2005 11:37am



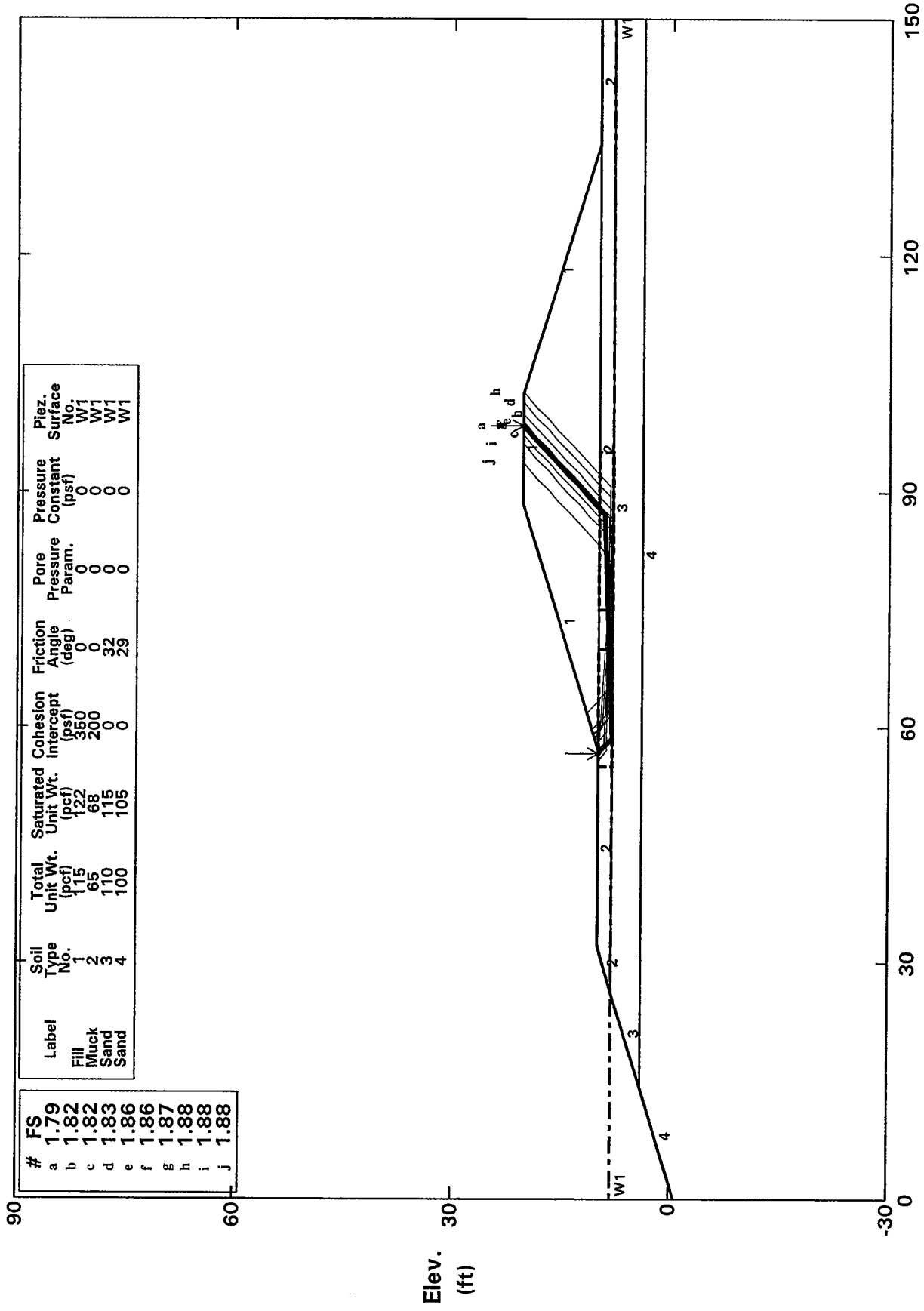
#	FS	Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
a	2.04	Fill	1	115	122	350	0	0	0	W1
b	2.04	Muck	2	65	68	200	0	0	0	W1
c	2.05	Sand	3	110	115	0	32	0	0	W1
d	2.05	Sand	4	100	105	0	29	0	0	W1
e	2.06									
f	2.07									
g	2.07									
h	2.07									
i	2.07									
j	2.07									

PCSTABL5M/SI FSmin = 2.04 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 1+000 EXPANSION TB-3 E.O.C.

Ten Most Critical. C:TB-3ECW.PLT By: Braulio Grajales 2/03/2005 11:45am

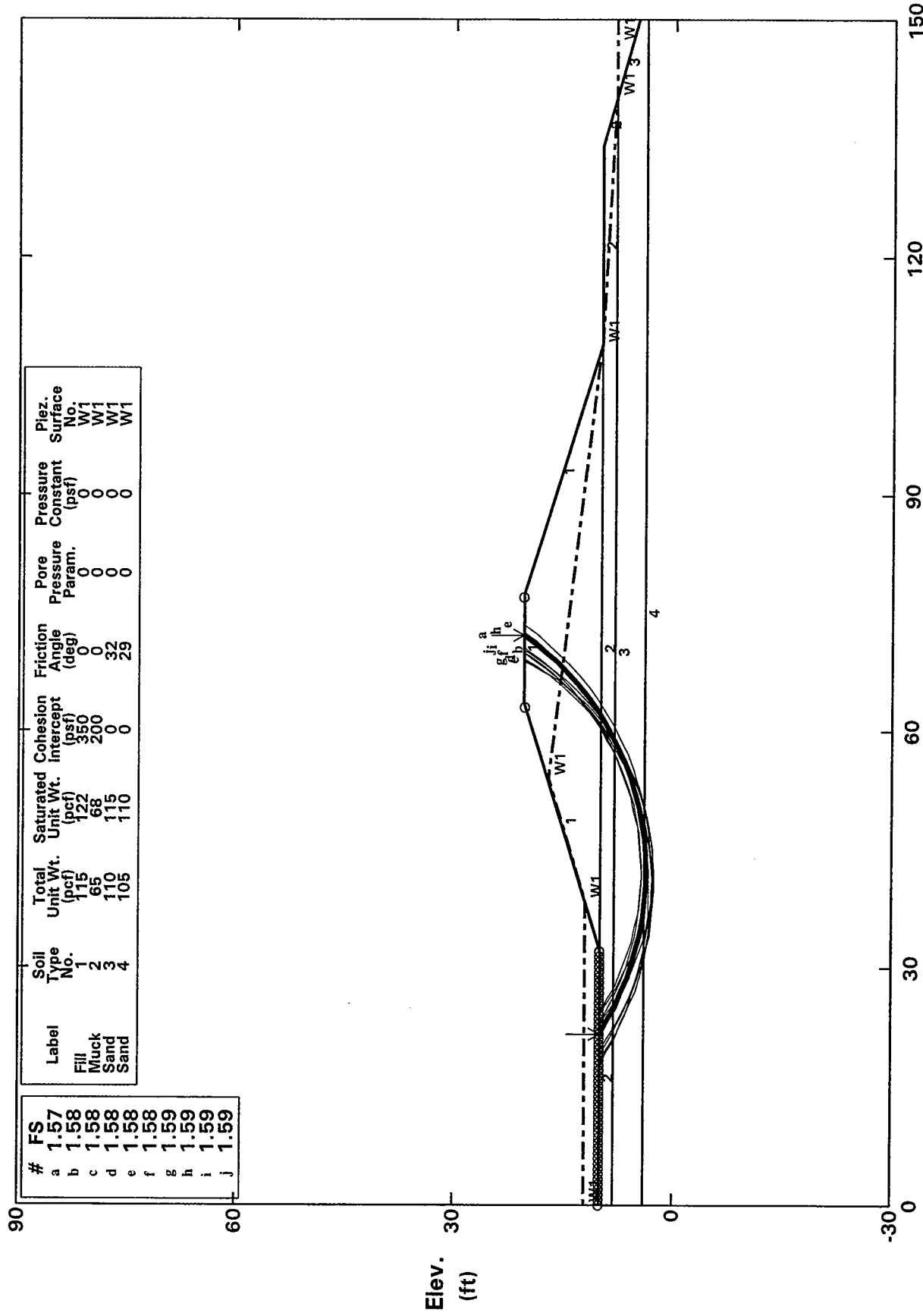


PCSTABL5M/SI FSmin = 1.79 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA - EXPANSION TB-3 R.D.

Ten Most Critical. C:TB-3RD.PLT By: Braulio Grajales 2/03/2005 11:47am

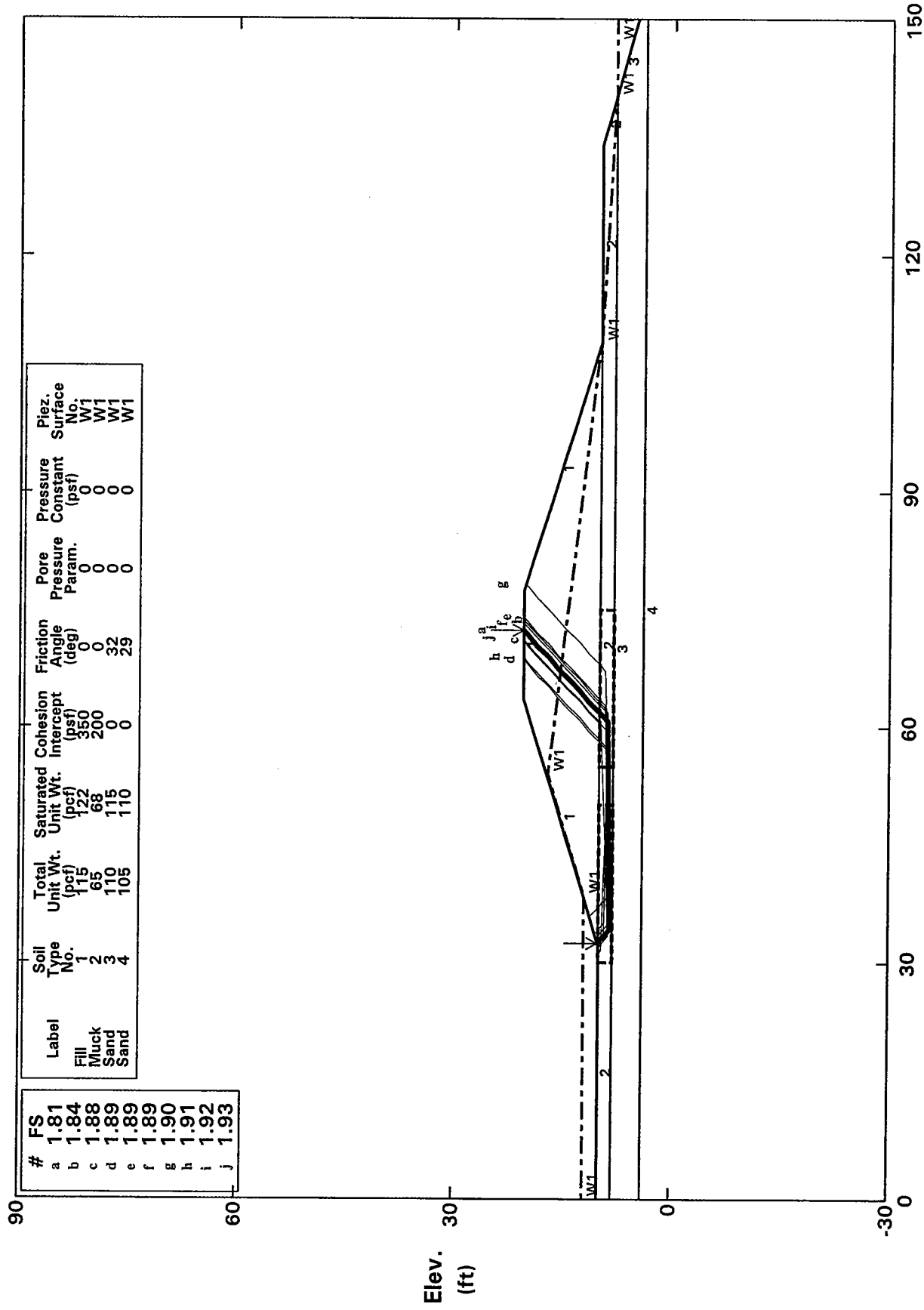


PCSTABL5M/SI FSmin = 1.57 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION TB-3 R.D.

Ten Most Critical. C:TB-3RDW.PLT By: Braulio Grajales 2/03/2005 11:49am

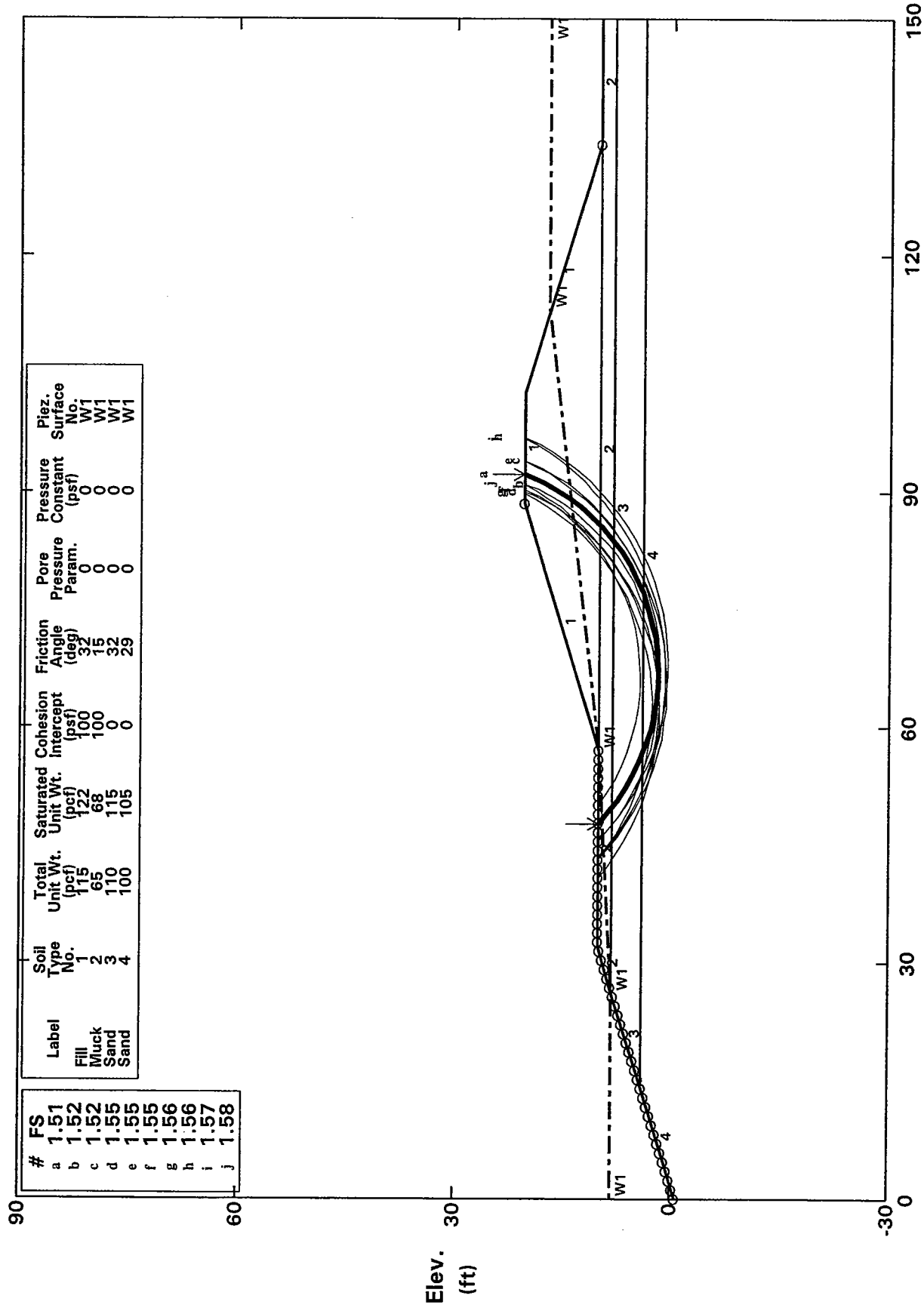


PCSTABL5M/SI FSmin = 1.81 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION TB-3 S.S.

Ten Most Critical. C:TB-3SS.PLT By: Braulio Grajales 2/03/2005 11:41am

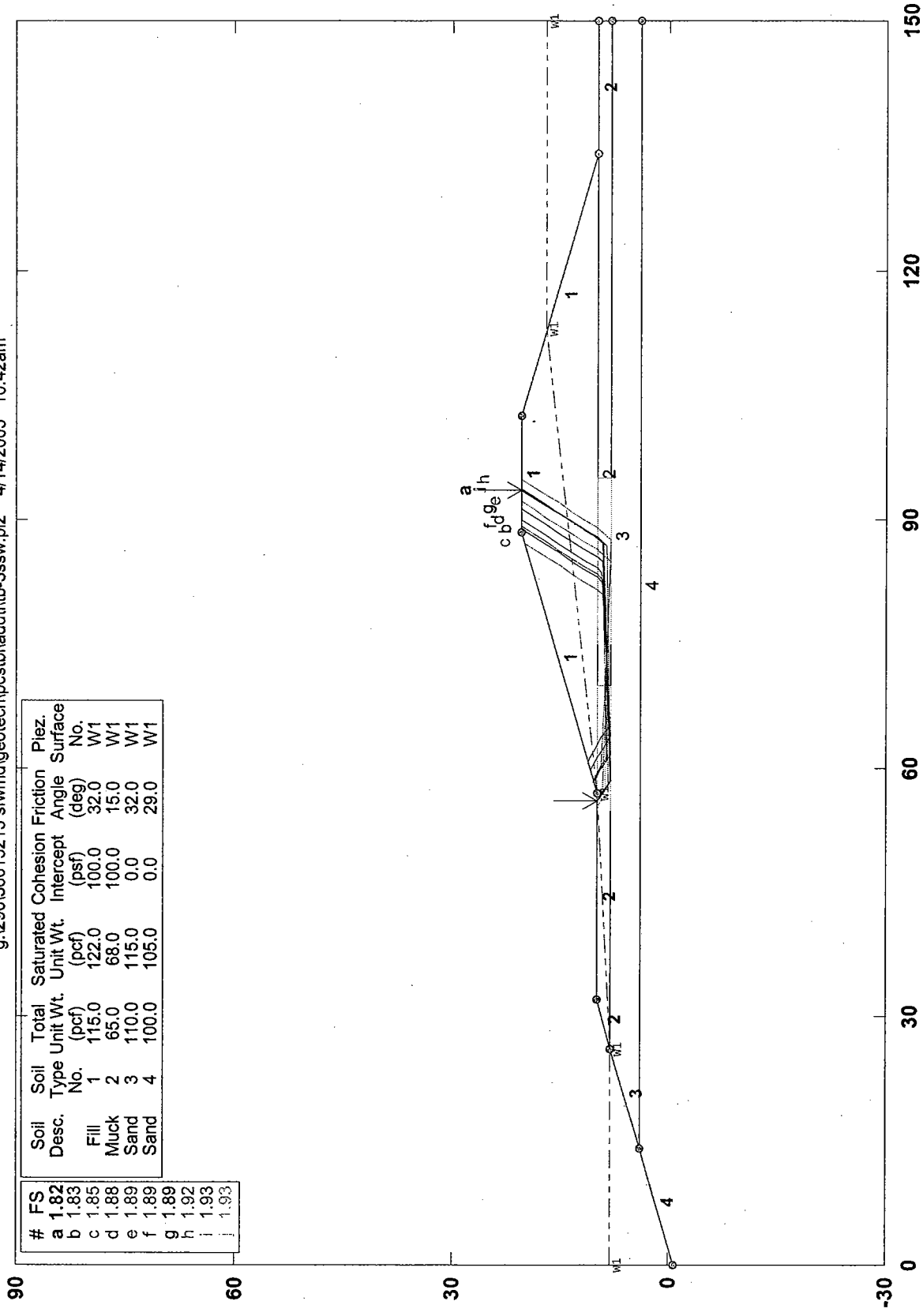


PCSTABL5M/SI FSmin = 1.51 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION TB-3 S.S.

g:\296\38615215 sfwmd\geotech\postb\add\tb-3ssw.pl2 4/14/2005 10:42am



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.82	Fill	1	115.0	122.0	100.0	32.0	W1
b	1.83	Muck	2	65.0	68.0	100.0	15.0	W1
c	1.85	Sand	3	110.0	115.0	0.0	32.0	W1
d	1.88	Sand	4	100.0	105.0	0.0	29.0	W1
e	1.89							
f	1.89							
g	1.89							
h	1.92							
i	1.93							
j	1.93							

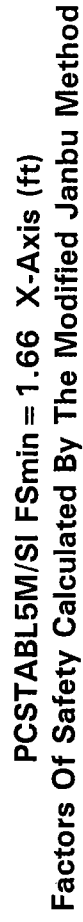
PCSTABL5M/si FSmin=1.82  
Safety Factors Are Calculated By The Modified Janbu Method

STED



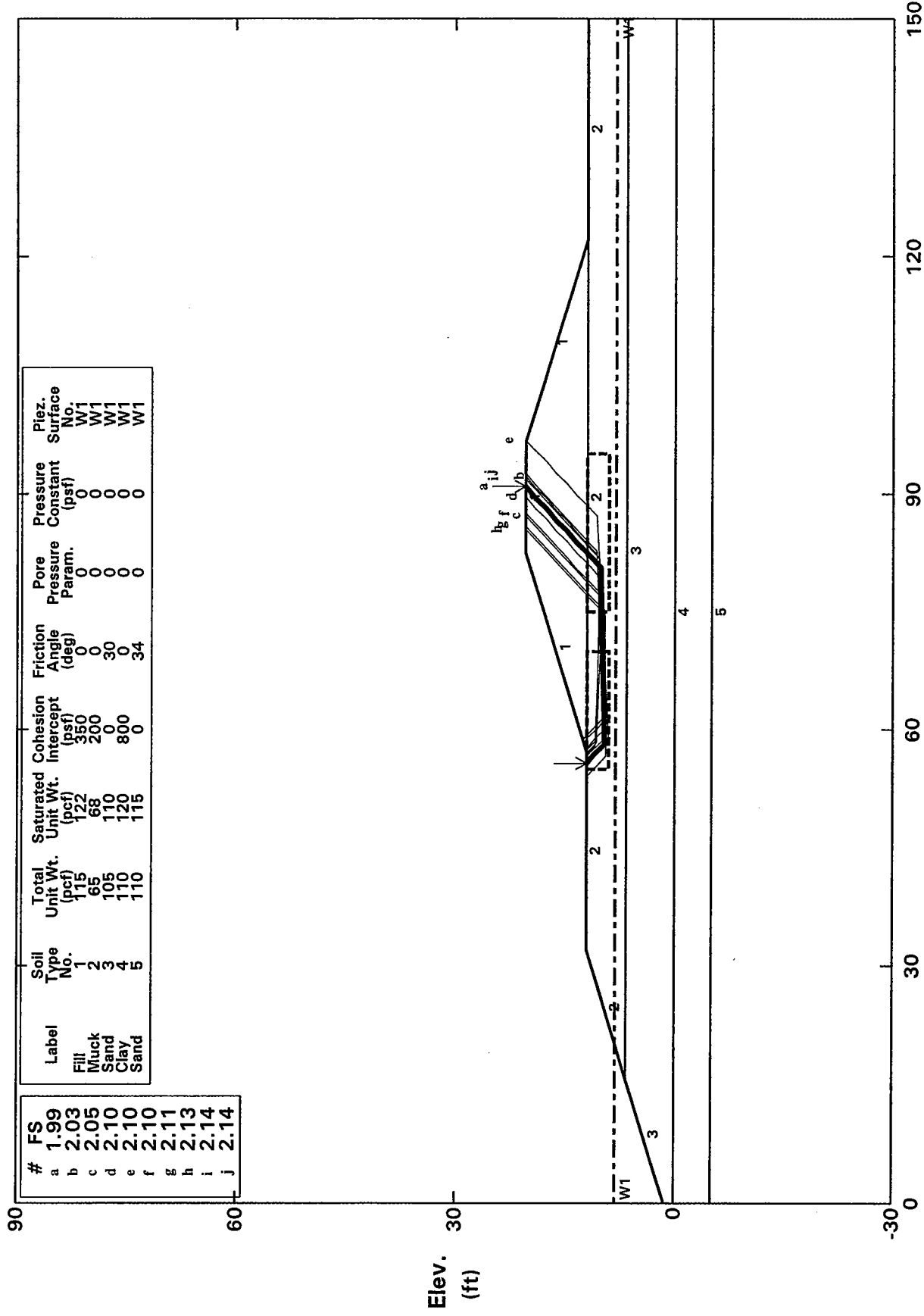
**SFWMD STA 5 EXPANSION TB-21 E.O.C.**

**Ten Most Critical. C:TB-21EC.PLT By: Braulio Grajales 2/03/2005 11:08am**



SFWMD STA 1 (PANSION TB-21 E.O.C.

Ten Most Critical. C:TB-21ECW.PLT By: Braulio Grajales 2/03/2005 11:27am



PCSTABL5M/SI FSmin = 1.99 X-Axis (ft)

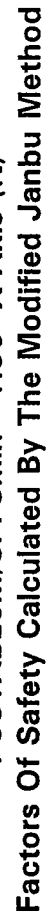
Factors Of Safety Calculated By The Modified Janbu Method

**FWMD STA**      **EXPANSION TB-21 R.D.**  
**Ten Most Critical. C:TB-21RD.PLT**    **By: Braulio Grajales**    **2/03/2005**    **6:40pm**

**Ten Most Critical. C:TB-21RD.PLT By: Braulio Grajales 2/03/2005 6:40pm**

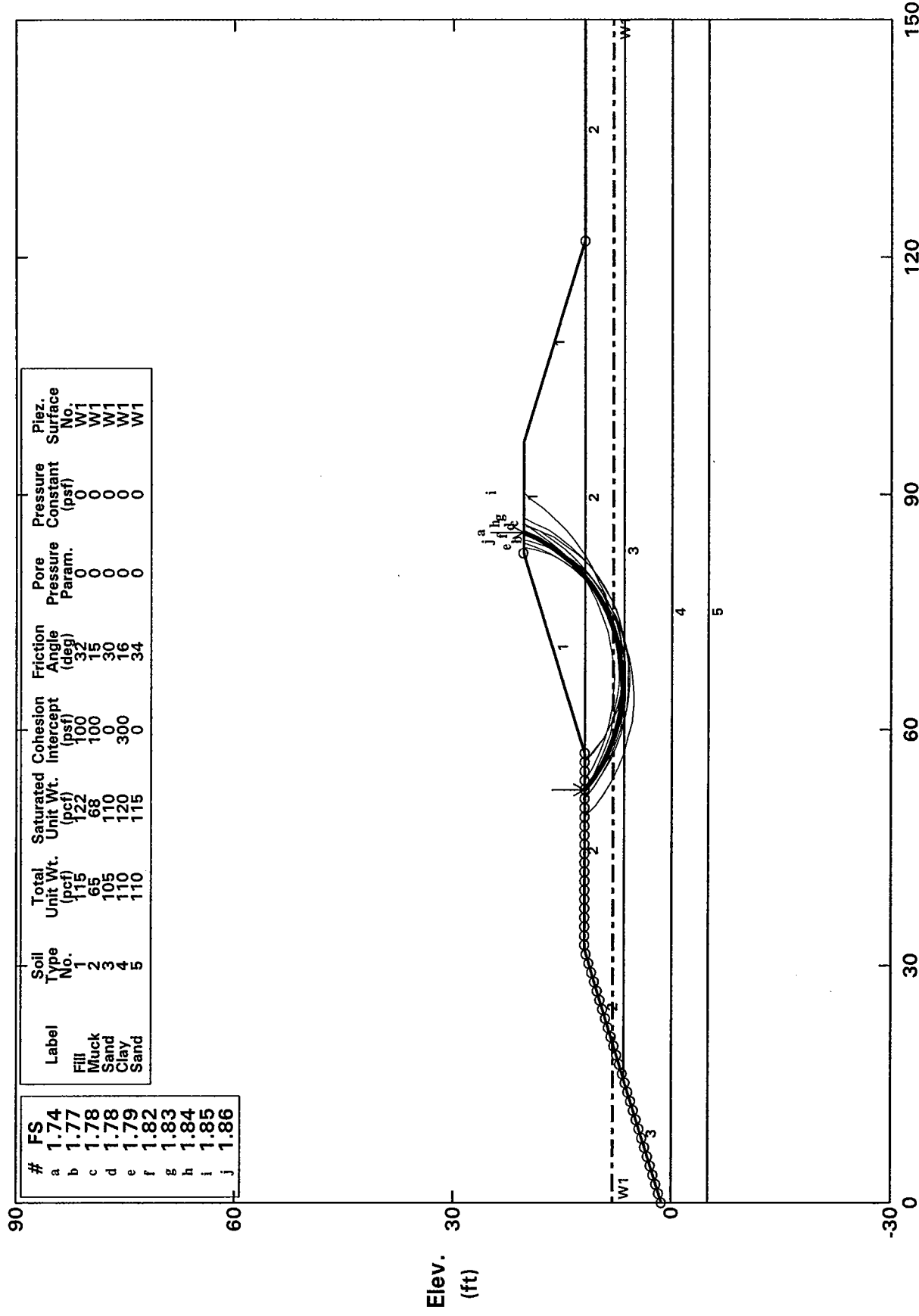


Ten Most Critical. C:TB-21RDW.PLT By: Braulio Grajales 2/03/2005 6:41pm



# SFWMD STA 21 EXPANSION TB-21 S.S.

Ten Most Critical. C:TB-21SS.PLT By: Braulio Grajales 2/03/2005 11:52am

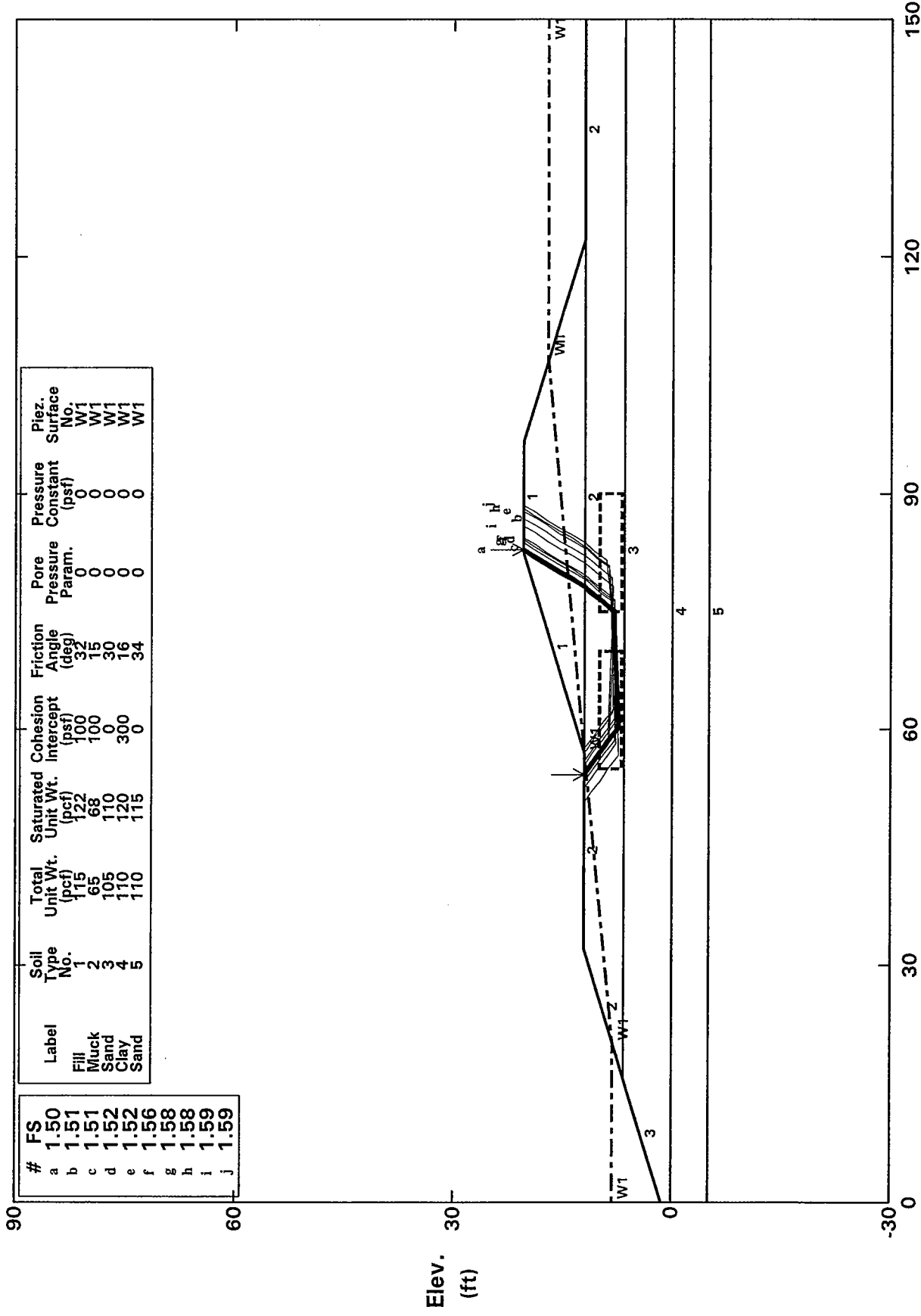


PCSTABL5M/SI FSmin = 1.74 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA EXPANSION TB-21 S.S.

Ten Most Critical. C:TB-21SSW.PLT By: Braulio Grajales 4/14/2005 4:38pm

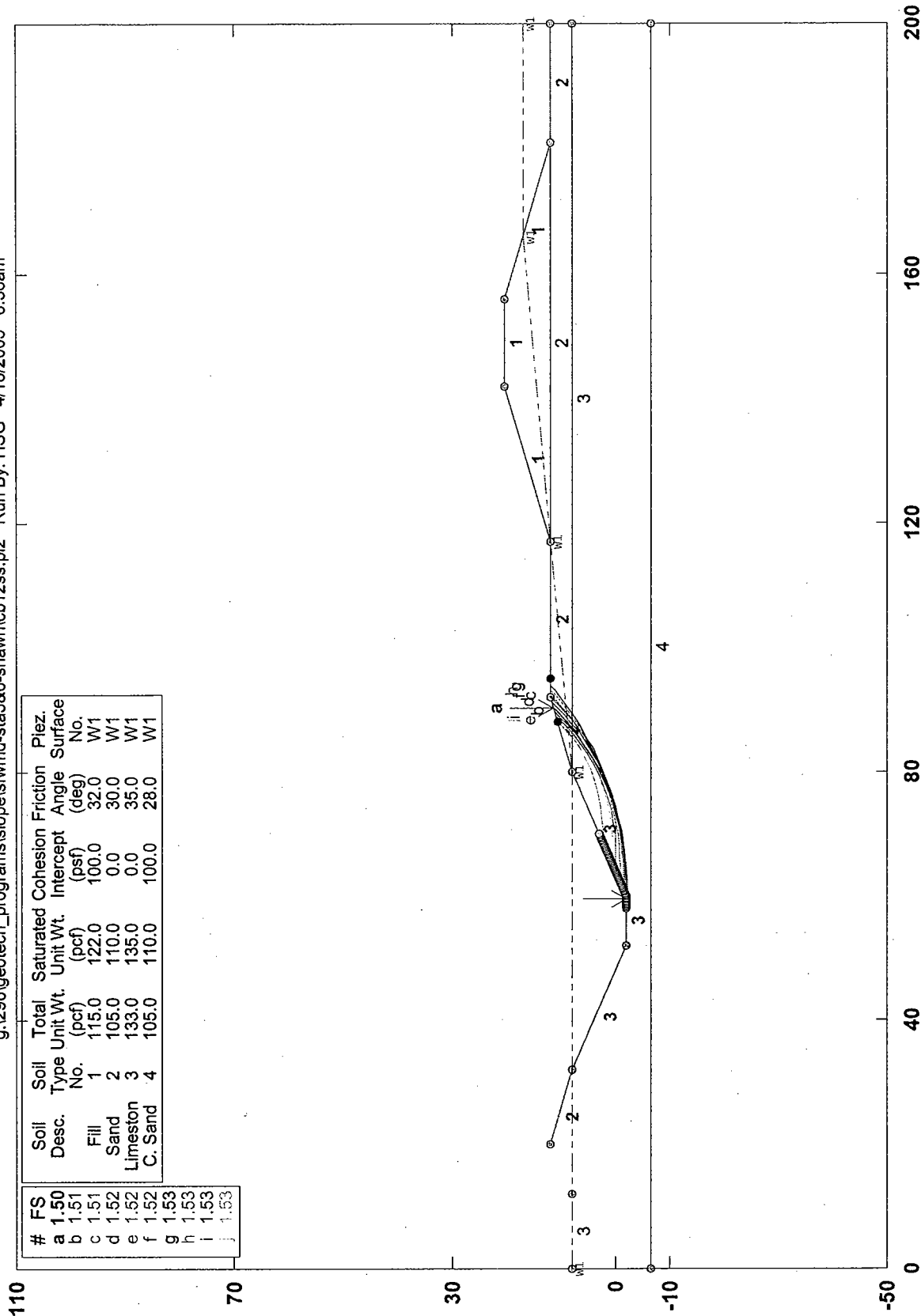


PCSTABL5M/SI FSmin = 1.50 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION CB-12 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\slope\sfwmd-sta5&6-shawn\cb12ss.pl2 Run By: HSG 4/18/2005 8:38am



STED

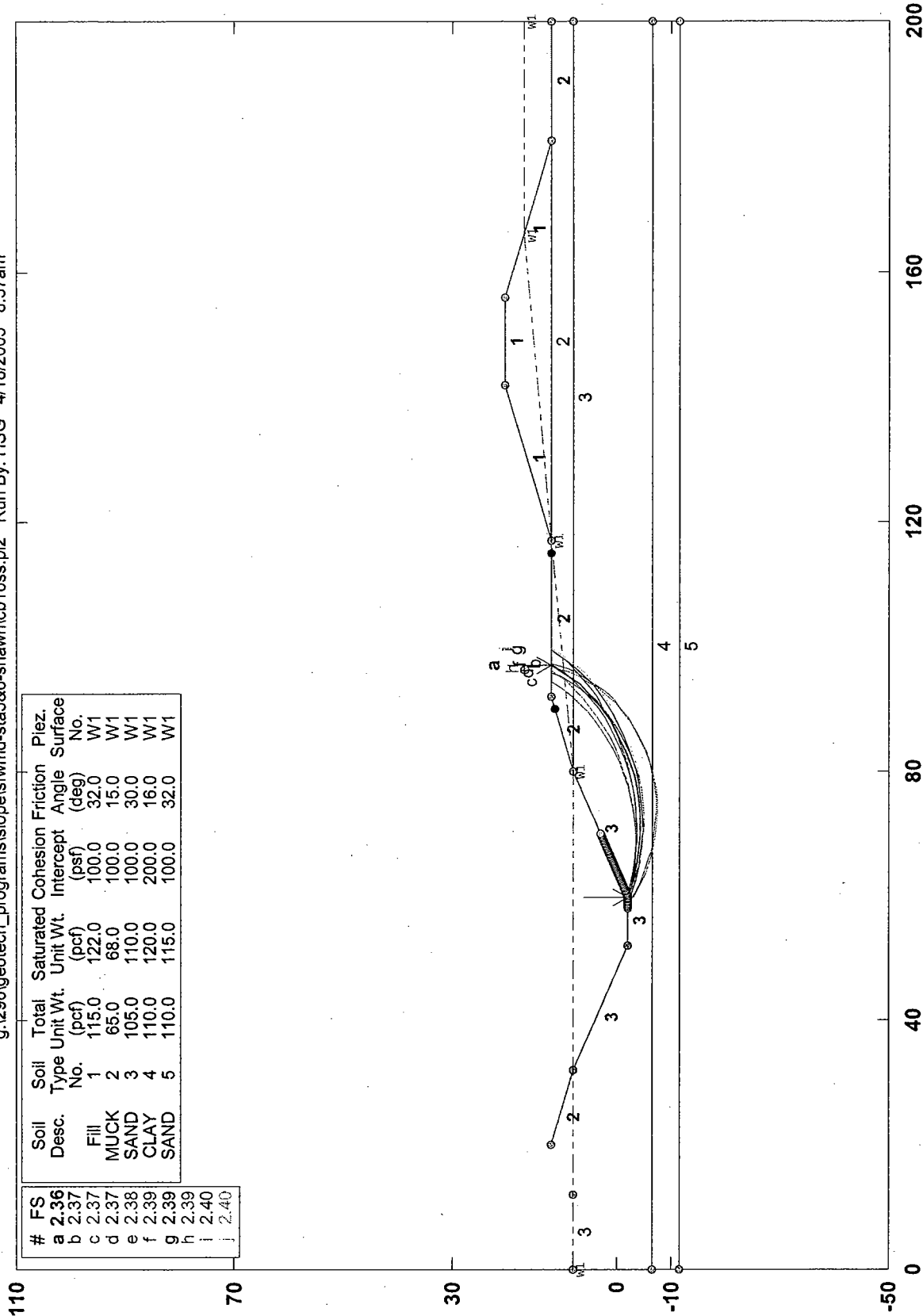


PCSTABL5M/si FSmin=1.50

Safety Factors Are Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION CB-16 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\slopes\sfwmd-sta5&6-shawn\cb16ss.pl2 Run By: HSG 4/18/2005 8:37am



STED

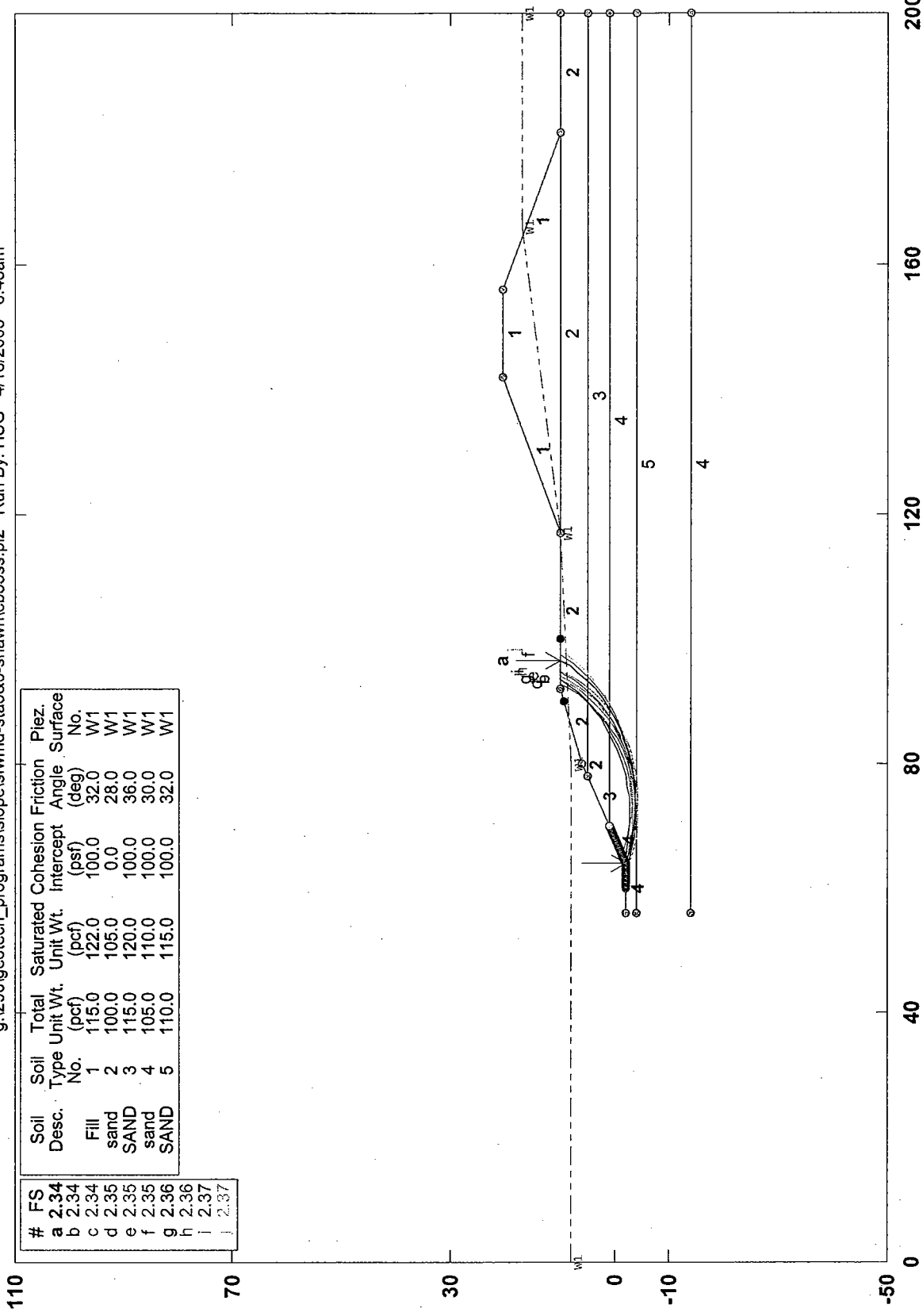


PCSTABL5M/si FSmin=2.36

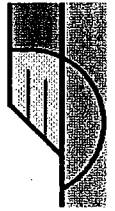
Safety Factors Are Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION CB-33 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\lopes\sfwmd-sta5&6-shawn\cb33ss.pl2 Run By: HSG 4/18/2005 8:43am



STED

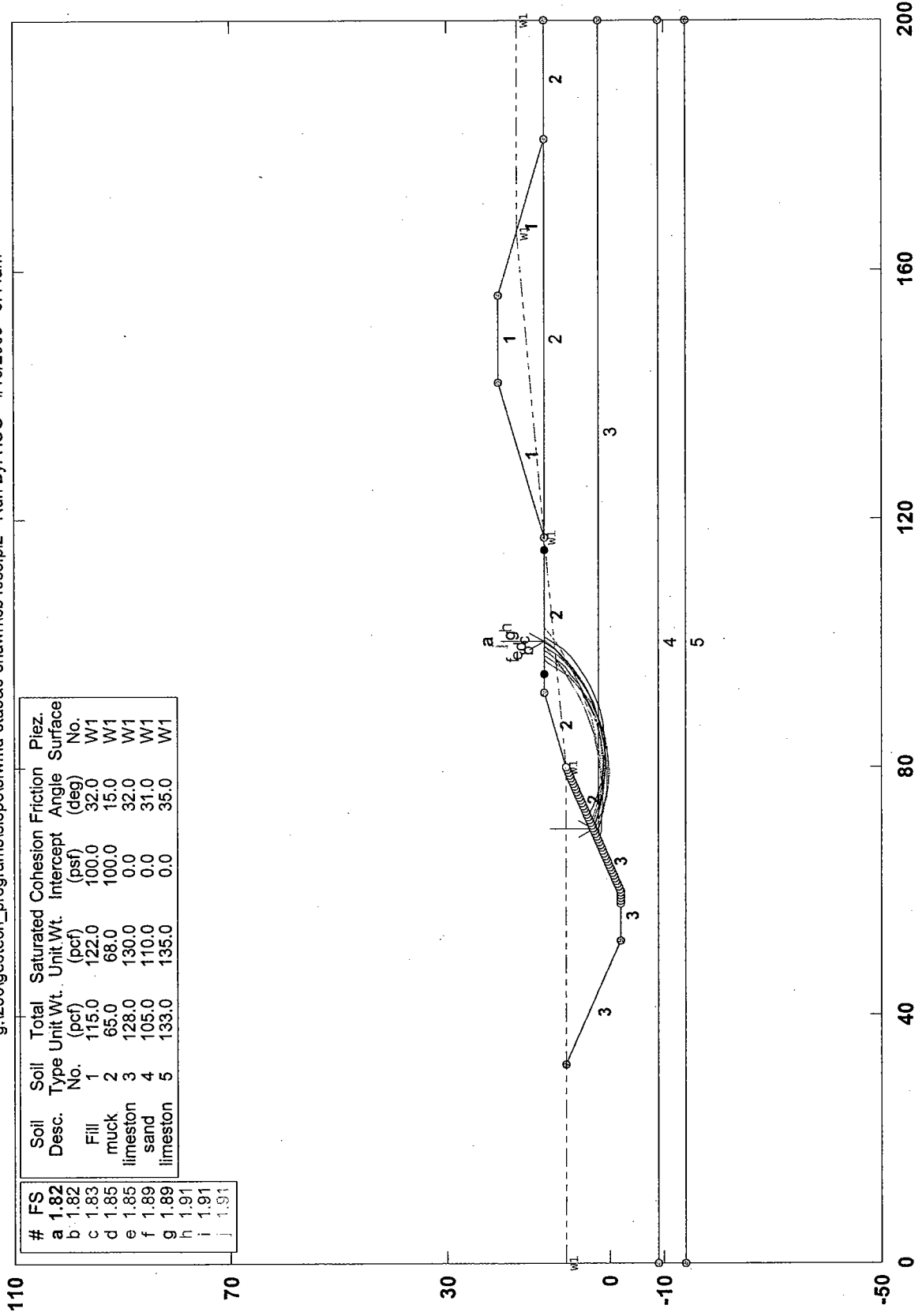


PCSTABL5M/si FSmin=2.34

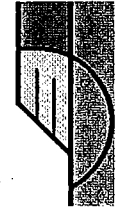
Safety Factors Are Calculated By The Modified Janbu Method

# SFWMD STA 6 EXPANSION CB-40 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\slope\sfwmd-sta5&6-shawn\cb40ss.pl2 Run By: HSG 4/18/2005 8:44am



STED

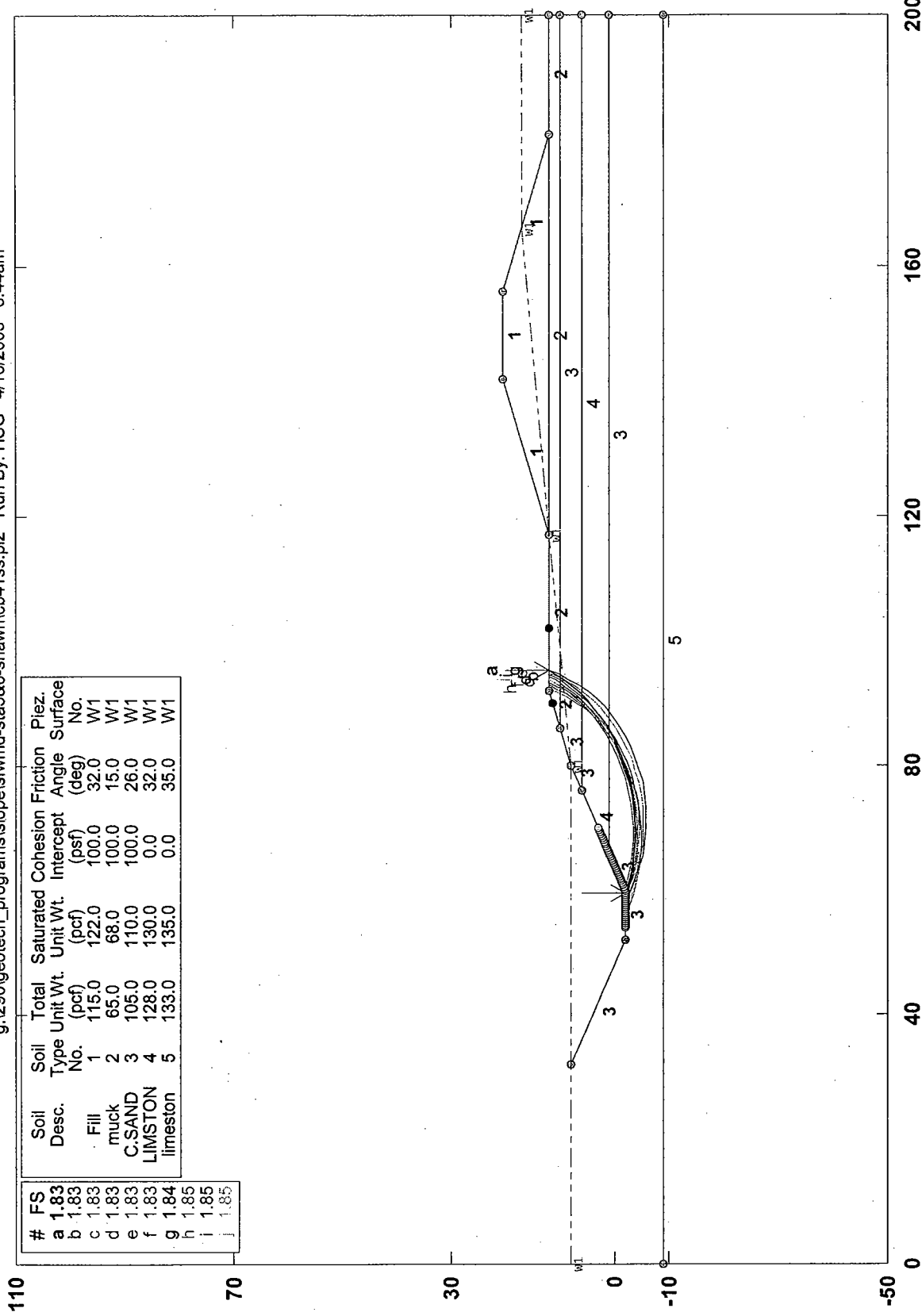


PCSTABL5M/si FSmin=1.82

Safety Factors Are Calculated By The Modified Janbu Method

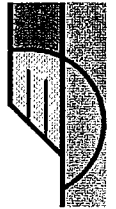
# SFWMD STA 6 EXPANSION CB-41 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\slope\sfwmd-sta5&6-shawn\cb41ss.pl2 Run By: HSG 4/18/2005 8:44am



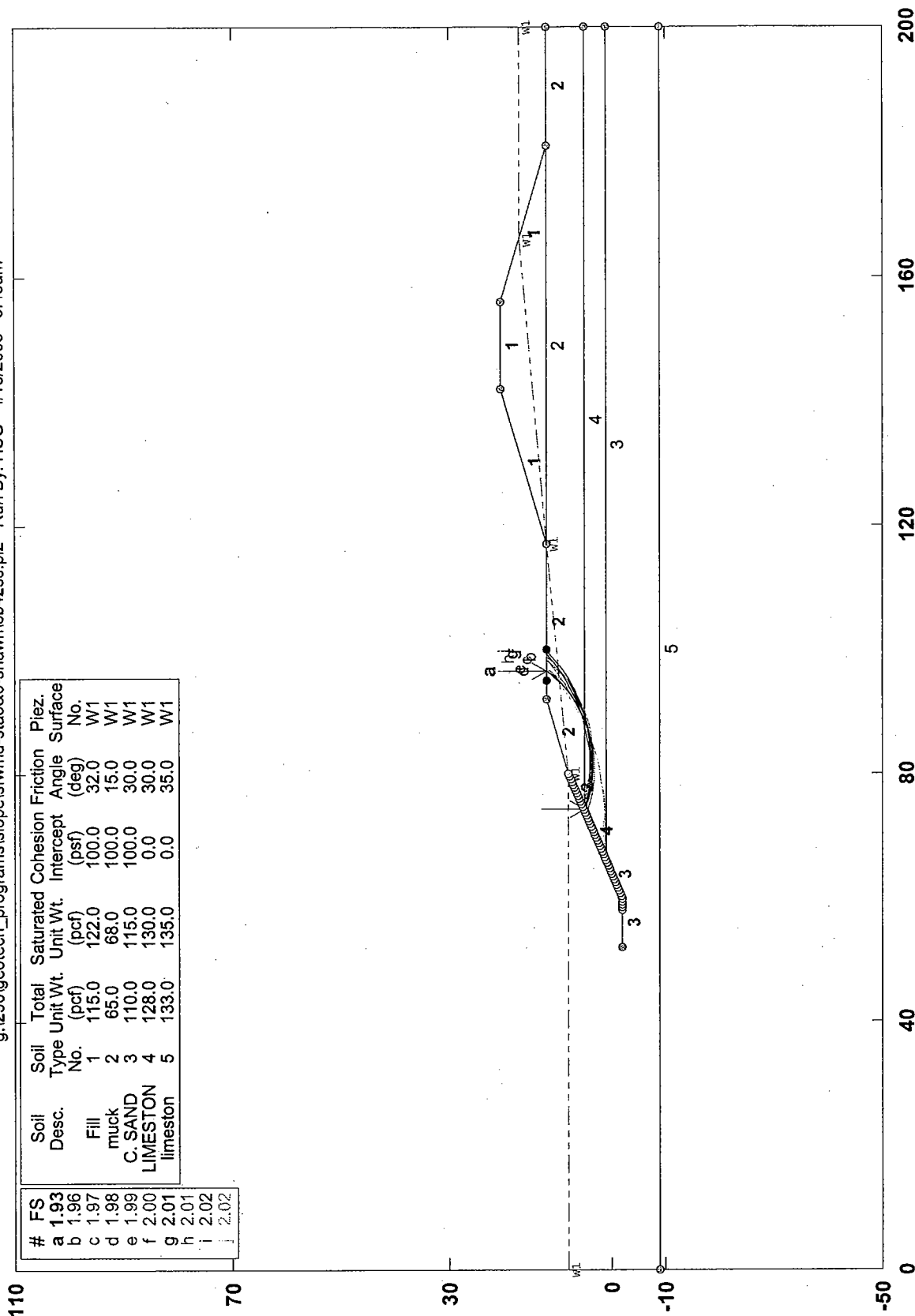
PCSTABL5M/si FSmin=1.83  
Safety Factors Are Calculated By The Modified Janbu Method

STED



# SFWMD STA 6 EXPANSION CB-42 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\stope\sfwmd-sta5&6-shawn\cb42ss.pl2 Run By: HSG 4/18/2005 8:45am



PCSTABL5M/si FSmin=1.93

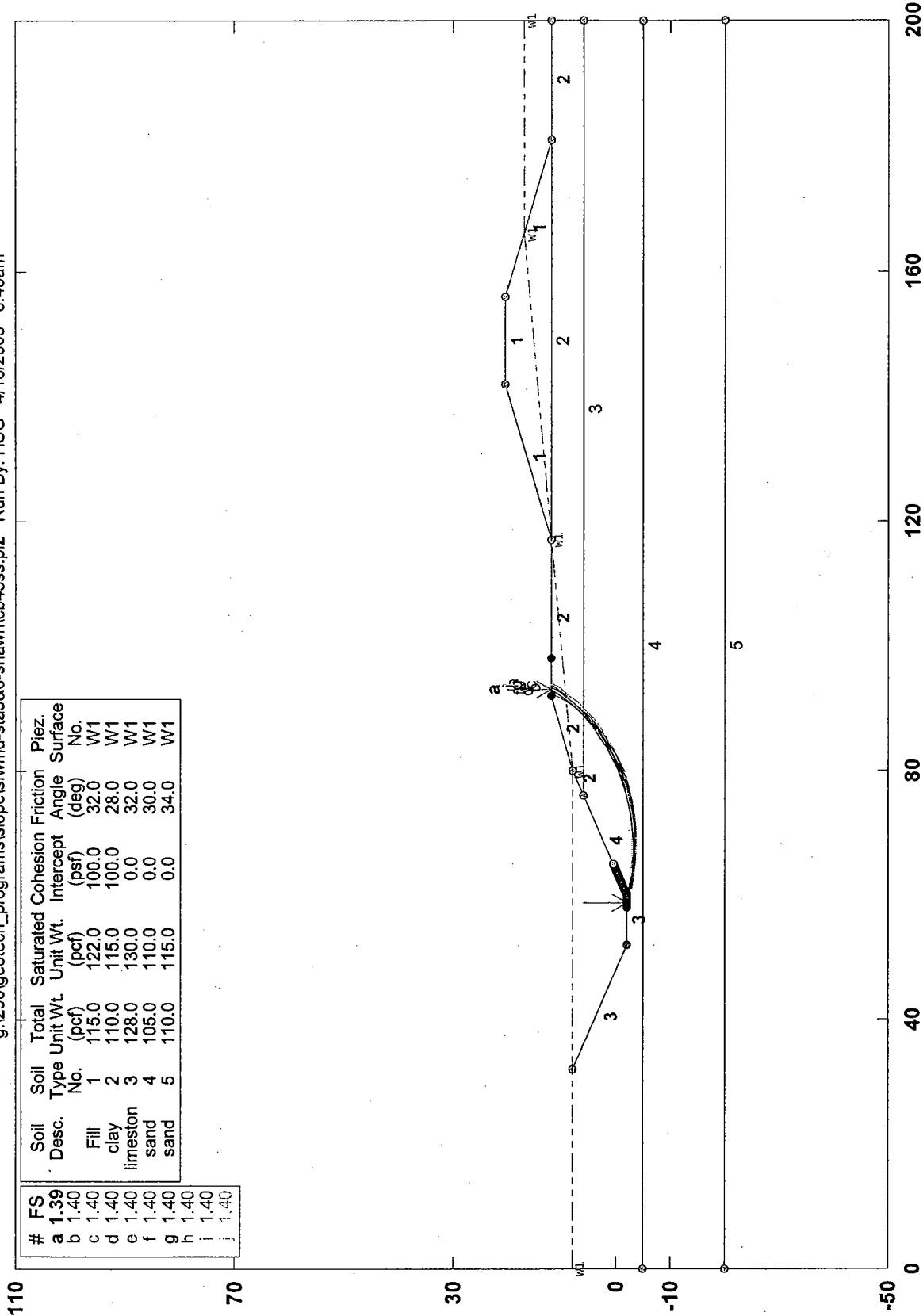
Safety Factors Are Calculated By The Modified Janbu Method

STED



# SFWMD STA 6 EXPANSION CB-43 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\islopes\fwmd-sta5&6-shawn\cb43ss.pl2 Run By: HSG 4/18/2005 8:45am



PCSTABL5M/si FSmin=1.39

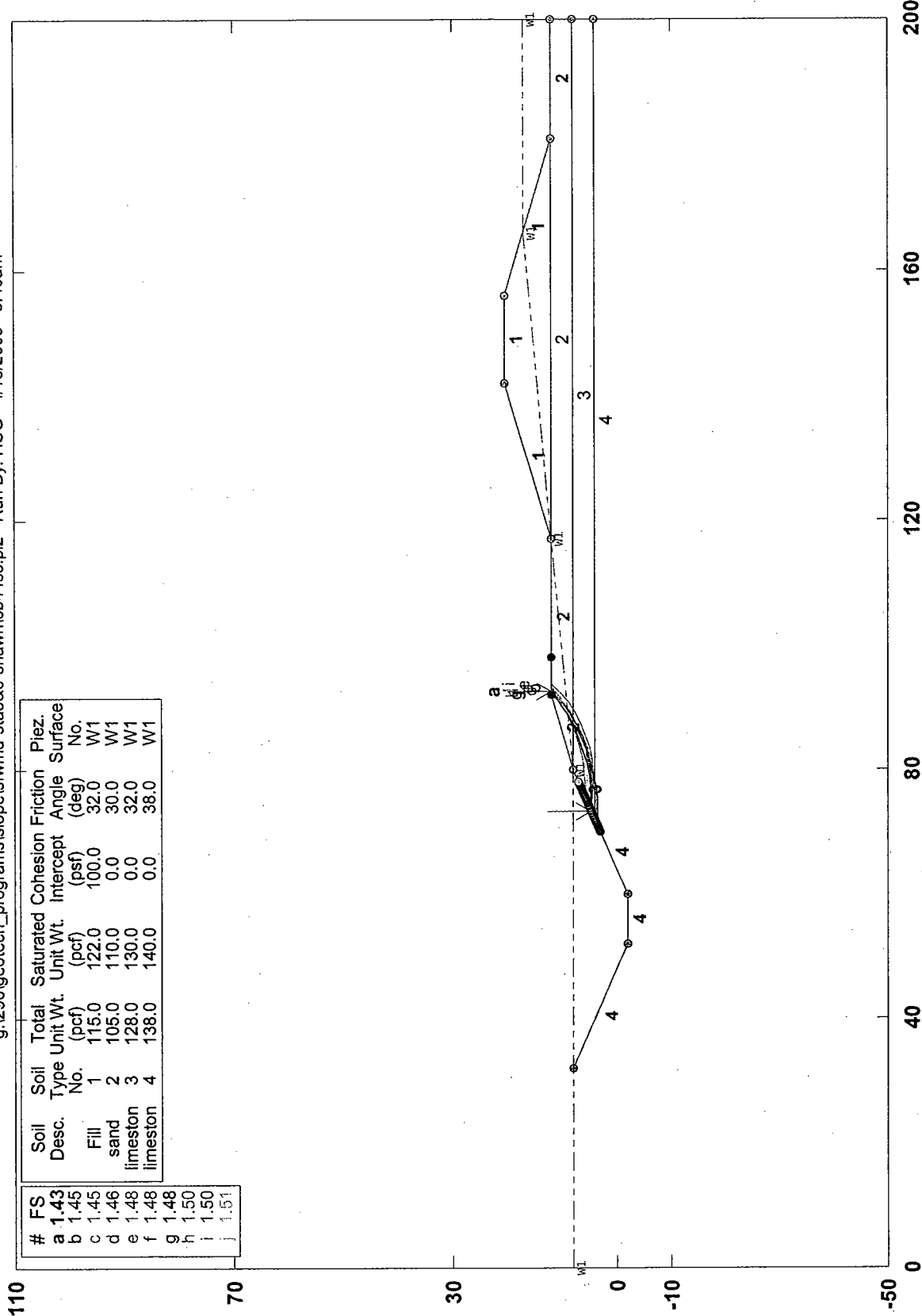
Safety Factors Are Calculated By The Modified Janbu Method

STED



# SFWMD STA 6 EXPANSION CB-44 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\islopes\sfwmd-sta5&6-shawn\cb44ss.pl2 Run By: HSG 4/18/2005 8:46am



PCSTABL5M/si FSmin=1.43

Safety Factors Are Calculated By The Modified Janbu Method

STED



# SFWMD STA 5 EXPANSION TB-21 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\slope\sfwmd-sta5&6-shawn\lb21ss.pl2 Run By: HSG 4/18/2005 8:46am

110

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.69	Fill	1	115.0	122.0	100.0	32.0	W1
b	1.70	muck	2	65.0	68.0	100.0	15.0	W1
c	1.71	sand	3	105.0	110.0	0.0	30.0	W1
d	1.71	clay	4	110.0	120.0	300.0	16.0	W1
e	1.71	sand	5	110.0	115.0	0.0	34.0	W1
f	1.72							
g	1.72							
h	1.72							
i	1.73							
j	1.73							

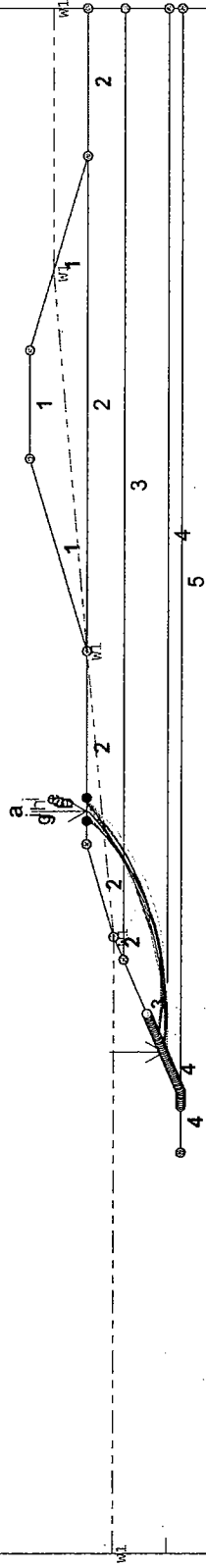
70

30

0

-10

-50



200

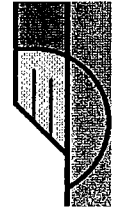
160

120

80

40

STED

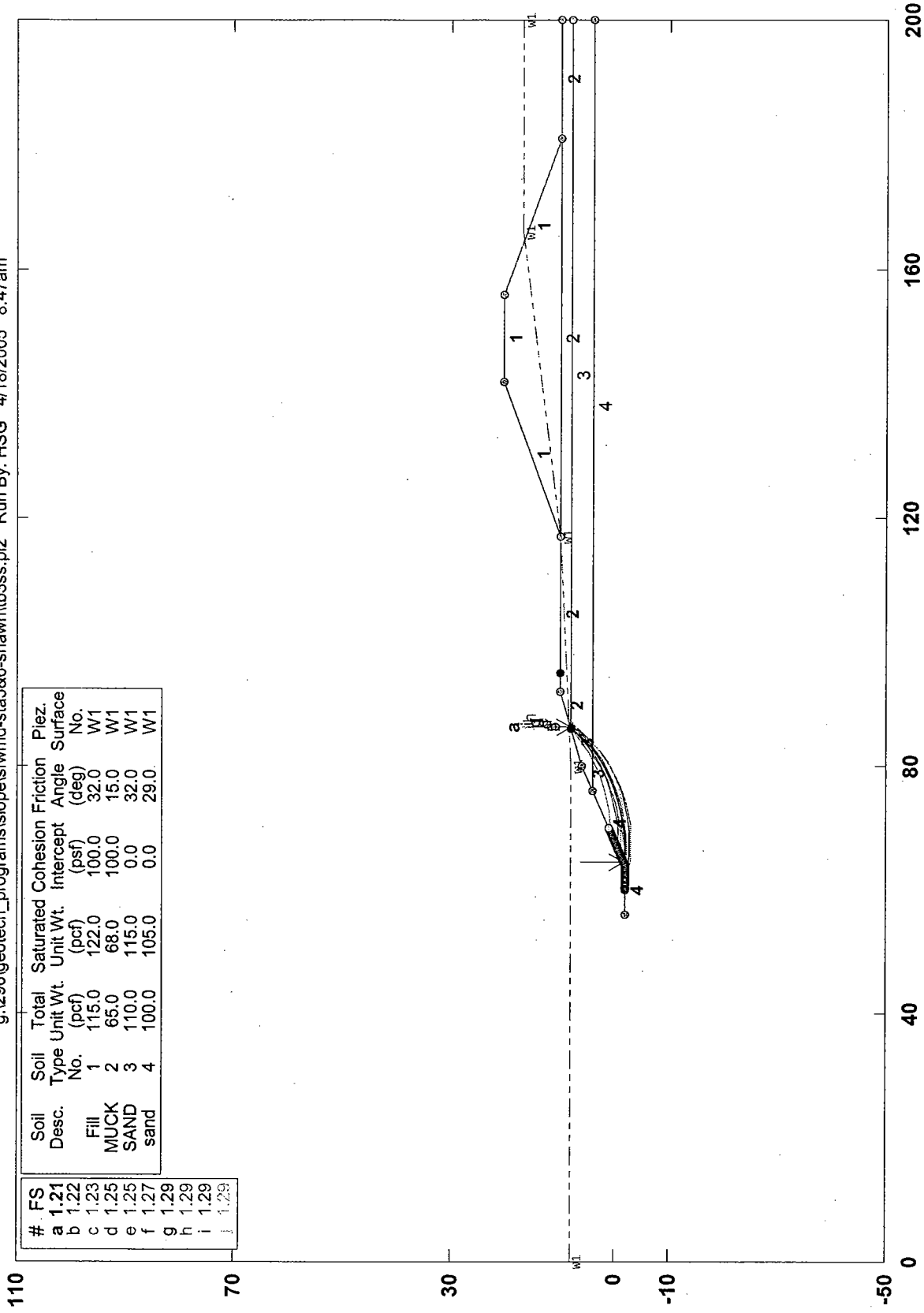


PCSTABL5M/si FSmin=1.69

Safety Factors Are Calculated By The Modified Janbu Method

# SFWMD STA 5 EXPANSION TB-3 S.S. canal with 3:1 and 2:1 slope

g:\296\geotech\_programs\lslopes\sfwmd-sta5&6-shawn\lb3ss.pl2 Run By: HSG 4/18/2005 8:47am



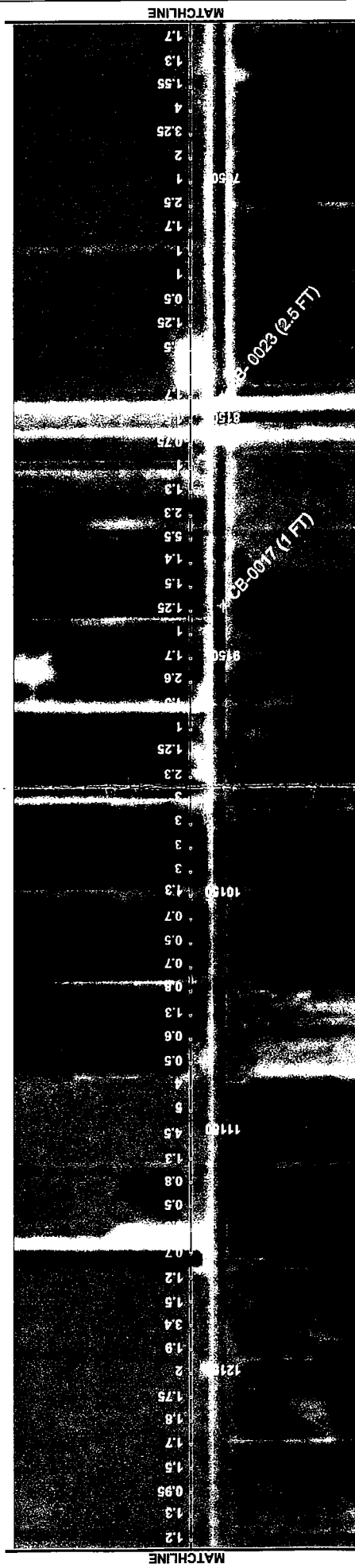
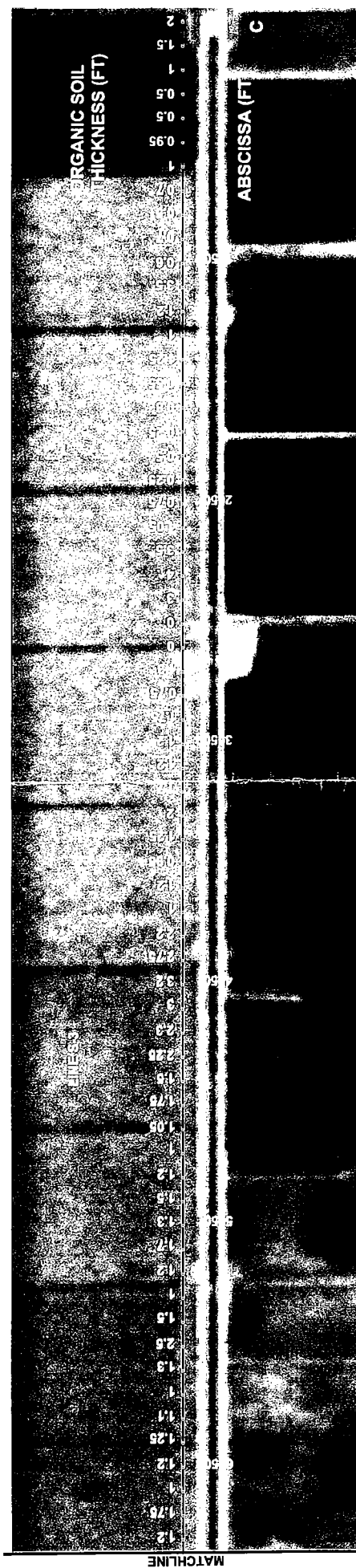
PCSTABL5M/si FSmin=1.21  
Safety Factors Are Calculated By The Modified Janbu Method

STED



## **APPENDIX F**

### **MUCK PROBE DATA**



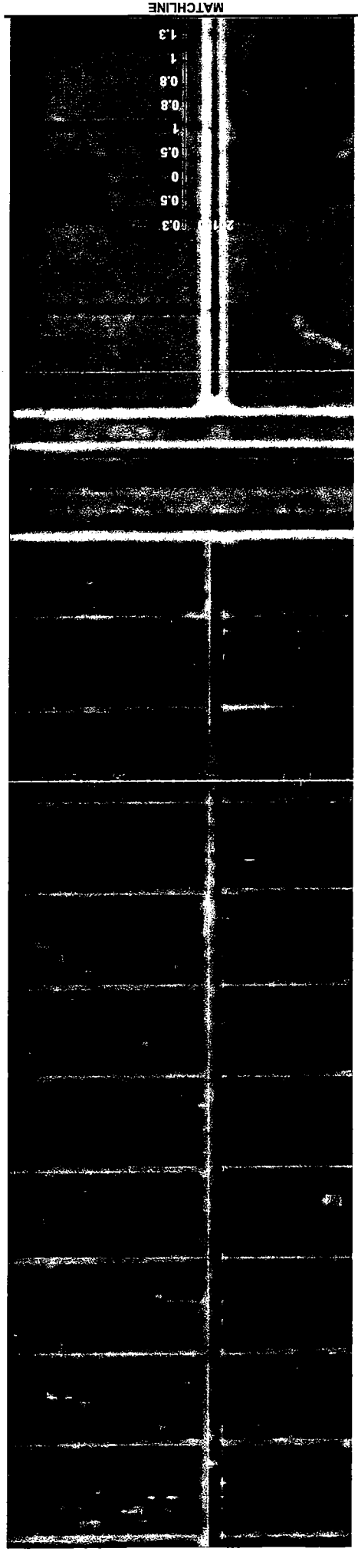
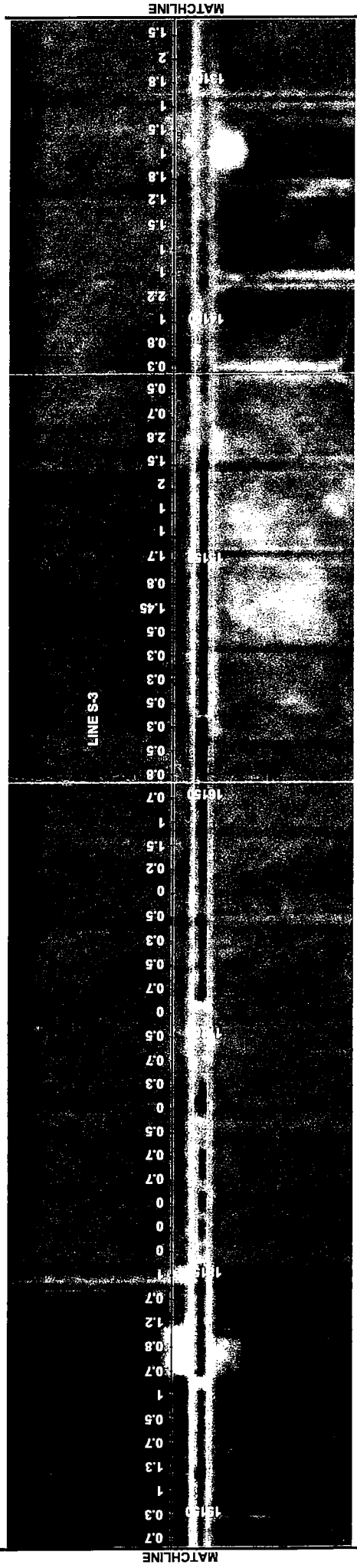
**TITLE:**  
**S-3 SHEET 01**

**URS**

7800 CONGRESS AVENUE, SUITE 200  
BOCA RATON, FLORIDA 33487 • 1350  
PHONE: (561) 994-8500  
FAX: (561) 994-8524  
CERT. OF AUTHORIZATION NO. 1213

**Scale: 1"=400'**

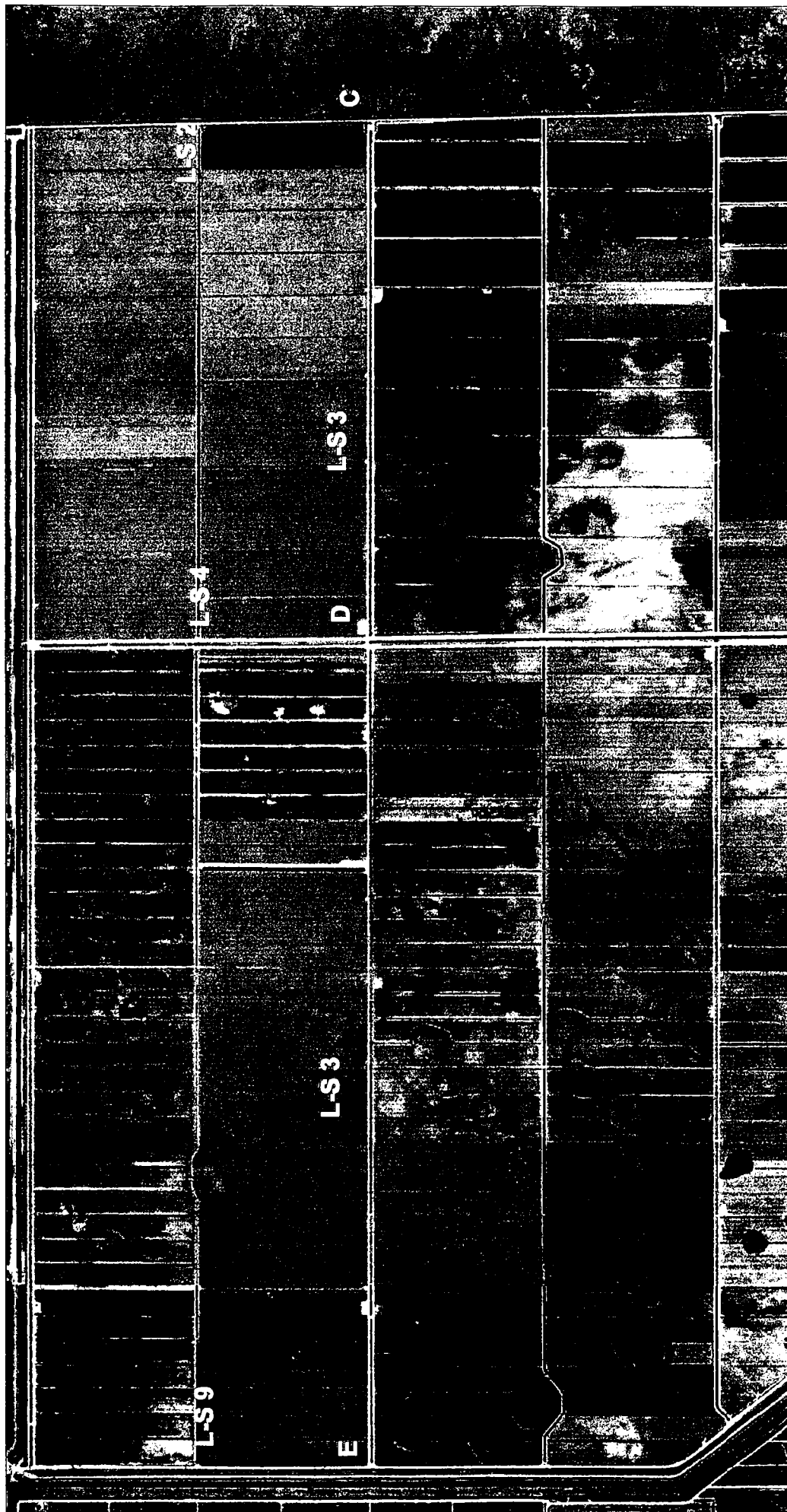




TITLE:  
S-3 SHEET 02

**URS**  
7800 CONGRESS AVENUE, SUITE 200  
BOCA RATON, FLORIDA 33487-1550  
PHONE (954) 394-6500  
FAX (954) 394-6524  
CERT. OF AUTHORIZATION NO. 1213

Scale: 1"=400'



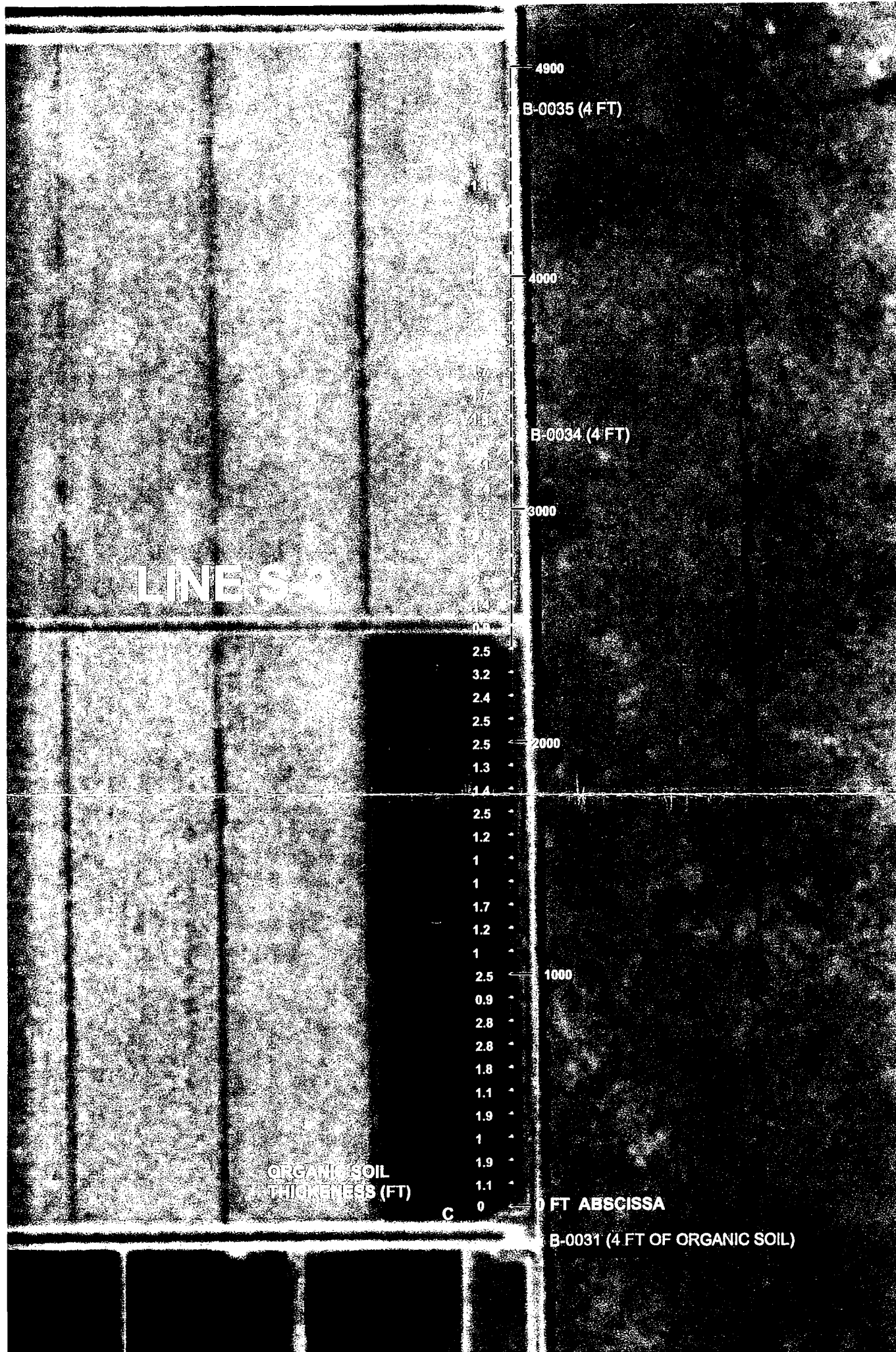
**N.T.S**

**TITLE:**

**URS**

**7800 CONGRESS AVENUE, SUITE 200  
BOCA RATON, FLORIDA 33487 -1350  
PHONE: (561) 994-6500**

FAX: (581) 994-6524  
CERT. OF AUTHORIZATION NO. 1213



LINE S-9

ABSCISSA (FT)

ORGANIC SOIL  
THICKNESS (FT)

CB-0018 (2.5 FT)

LINE S-4

CB-0021 (3 FT)

ABSCISSA (FT)

ORGANIC SOIL  
THICKNESS (FT)